A PROCEDURE TO FACILITATE TESTING OF A TWO-SIDED COMPOSITE NULL HYPOTHESIS ABOUT THE MEAN OF A NORMALLY DISTRIBUTED RANDOM VARIABLE.

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THESIS

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A procedure was developed to aid in the testing of a two-sided composite null hypothesis about the mean of a normally distributed random variable for situations where either the population variance is known or unknown. The procedure was designed to eliminate the requirement for iterative type solution techniques normally used in determining the acceptance or rejection region of the subject hypothesis.

(20. ABSTRACT Continued)

This thesis provides guidelines, curves, and tables which will aid in testing a two-sided composite null hypothesis. Provisions were also incorporated into the procedure to permit testing of hypotheses about the relative displacement of the coefficient of variation from zero.

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A Procedure to Facilitate Testing of a Two-Sided Composite Null Hypothesis About The Mean of a Normally Distributed Random Variable

by

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B.S. University of Maryland, 1970

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A procedure was developed to aid in the testing of a two-sided composite null hypothesis about the mean of a normally distributed random variable for situations where either the population variance is known or unknown. The procedure was designed to eliminate the requirement for iterative type solution techniques normally used in determining the acceptance or rejection region of the subject hypothesis. This thesis provides guidelines, curves, and tables which will aid in testing a two-sided composite null hypothesis. Provisions were also incorporated into the procedure to permit testing of hypotheses about the relative displacement of the coefficient of variation from zero.

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SYMBOLOGY

α = Probability of a Type I error.

β = Probability of a Type II error.

C = Critical value defining the rejection or acceptance region centered around μ_o (σ known case) or zero (σ unknown case).

C_L, C_R = The lower bound (C_L) and upper bound (C_R) on the critical region.

$\bar{x}$ = $\frac{\sum_{i=1}^{n} x_i}{n}$.

μ = The true population expected value (mean).

μ_o = A specified value of the true population mean.

d_L, d_R = Specified lower (d_L) and upper (d_R) limits for the true population mean (μ).

σ^2 = Population variance (σ = population standard deviation).

$\hat{\sigma}^2$ = Sample variance used to estimate σ^2, specifically;

$$\hat{\sigma}^2 = \sum_{i=1}^{n} \frac{(x_i - \bar{x})^2}{n-1} .$$

δ = $\frac{d_L + d_R}{2}$.

n = sample size.

C^* = $\frac{C\sqrt{n}}{\sigma}$.

a = $\frac{\delta\sqrt{n}}{\sigma}$.

CV = Coefficient of variation $(\frac{\sigma}{|\mu|})$.

CV_o = A specified value of the CV.

H_o = The null hypothesis of interest.

H_a = The alternative hypothesis to H_o.

P_T = The tail probability that a value equal to or more extreme than the observed $\bar{x}$ would have resulted if H_o were in fact true.

r = Desired maximum allowable variation of the true mean from some specified value (μ_o) in terms of a portion of the population standard deviation (i.e., $|\mu - \mu_o| \leq r\sigma$).

$\hat{r}$ = The statistic

$$\left| \frac{\sqrt{n}(\bar{x} - \mu_o)}{\sqrt{\hat{\sigma}^2}} \right| .$$

DF = Degrees of freedom.

λ = The non-centrality parameter of the non-central T distribution, $\lambda = r\sqrt{n}$.

$\Phi[x]$ = Normal cumulative distribution function.

I. INTRODUCTION

A. BACKGROUND AND PURPOSE

A procedure was developed to aid in testing a two-sided composite null hypothesis about the mean of a normally distributed random variable. The intent was to eliminate the need for iterative solution techniques when solving for critical values manually. In situations where computer assistance is inappropriate or unavailable, there is a tendency for the analyst to shift from the interval test requirement to the computationally easier two-sided simple hypothesis (i.e., that the mean is equal to the midrange value of the interval). By employing the procedure proposed in this thesis, the time required to test a two-sided composite null hypothesis by hand can be significantly reduced.

B. SCOPE

Procedures were developed for the following test requirements.

1. For Testing That $d_L \leq \mu \leq d_R$

For situations where the population variance is known, a method was developed for testing that the population mean is between two values (d_L and d_R).

2. For Testing That $|\mu - \mu_o| \leq r\sigma$

For situations where the population variance is unknown, a method was developed to test that the absolute value of the deviation of the population mean from some specified value (μ_o)

is less than or equal to a specified portion (r) of the population standard deviation. By a slight modification, this procedure can be used to test if the coefficient of variation is between zero and some specified value.

Each procedure consists of using relevant situation parameters (i.e., σ, n, δ, α, etc.) to determine the critical region using either interpolation curves or tabulated data. The procedure was designed to be versatile with respect to using Type I (α) and Type II (β) error level control, or using tail probabilities (P_T) for drawing statistical inference.

To simplify use of the procedure, the paper is organized so that the main body contains only 1) minor theoretical context, 2) detailed procedural guidelines, and 3) example applications. The detailed derivation of the procedure is provided in Appendix C for readers so inclined. Appendices A and B provide curves and tables used to find the associated rejection or acceptance regions and the tail area probability. The curves are provided to simplify critical value interpolation for what is considered to be the majority of applicable parameter values. However, the total breadth of parameter ranges considered in this paper is covered in the tabulated data of Appendix B. It should be noted that all explanatory figures in the main body of this paper are schematic in nature and do not represent scale drawings.

C. SYMBOL AND HYPOTHESIS TESTING CONVENTIONS PECULIAR TO THIS THESIS

Whenever possible, symbol and concept conventions which conform to standard hypothesis testing terminology were employed. However, because of requirements which are peculiar to this procedure, it was convenient in some instances to use terminology that may be new to the reader. The following symbol and concept conventions apply throughout this Thesis:

1. The Null Hypotheses (H_o) will always be bounded intervals such as $|\mu - \mu_o| \leq \delta$ or $|\mu - \mu_o| \leq r\sigma$. All alternative hypotheses are the complements of such intervals.

2. The level of significance is customarily a preassigned upper bound on the size of the critical region (i.e., that subset of the sample space reserved for rejection of H_o). This will hereafter be referred to as α error level control.

3. By reversing the role played by the null and alternative hypotheses, it is possible to define an acceptance region for the originally formulated interval null hypothesis with a specified preassigned upper bound (β) on the size of a type II error. This procedure is defined as β error level control.

II. RESULTS AND DISCUSSION

A. CASE OF KNOWN POPULATION VARIANCE

1. General Remarks

In order to test the null hypothesis that the population mean falls between two values (i.e., $d_L \leq \mu \leq d_R$), an iterative solution of equation 1 is required.

$$\text{(1)} \qquad \alpha = 1 - \Phi\left[\frac{\delta\sqrt{n}}{\sigma} + \frac{C\sqrt{n}}{\sigma}\right] + \Phi\left[\frac{\delta\sqrt{n}}{\sigma} - \frac{C\sqrt{n}}{\sigma}\right]$$

where,

σ is the known population standard deviation,

C is the value of the statistic $\bar{x}$ which defines the critical region centered around

$$\mu_o = \frac{d_L + d_R}{2},$$

α is the probability of a Type I error,

δ is equal to $\frac{d_R - d_L}{2}$, and

Φ is the integral of the standard normal probability density.

To determine a rejection region for the subject hypothesis, an initial value of C would be guessed and the right side of equation 1 calculated. A new C would then be used iteratively until the desired accuracy in the value of α had been obtained. This solution process is not difficult or time consuming with the assistance of a computer. However, when performed manually, such a process may require more effort than is warranted by the scope of the project.

The procedure developed in this thesis will provide the individual with a method for testing a two-sided composite null hypothesis which circumvents the previously described iterative solution technique. The procedure derivation is provided in Appendix C. In general, it consists of normalizing equation 1 by reparameterizing the terms $\frac{\delta\sqrt{n}}{\sigma}$ and $\frac{C\sqrt{n}}{\sigma}$ as the parameters "a" and C*, respectively. Appropriate values of C* are then obtained according to the prescribed procedure which follows.

2. Procedure Description

The procedure for testing that $d_L \leq \mu \leq d_R$ is outlined in Figure 1 (for α and β error control) and Figure 2 (for estimating P_T). This procedure was developed for situations where symmetric critical regions are of interest. A summary of the procedure follows.

a. For Controlling The α Error Level

First calculate $a = \frac{\delta\sqrt{n}}{\sigma}$. If the value of "a" is less than or equal to 1.7, the associated value of C* is obtained from Figure A-1 of Appendix A. The lower (C_L) and upper (C_R) bounds of the rejection region are then defined using equation 2.

$$(2) \quad C_L = \mu_o - \frac{C^*\sigma}{\sqrt{n}}, \quad C_R = \mu_o + \frac{C^*\sigma}{\sqrt{n}} \quad \text{where } \mu_o = \frac{d_L + d_R}{2}$$

If the calculated value of "a" is greater than 1.7, the relationship between "a" and C* becomes linear and equation 3 is used to define the rejection region (K_E is obtained from Figure 1). If $\bar{x} < C_L$ or $\bar{x} > C_R$ then reject

the hypothesis with a probability equal to α of rejecting when in fact the hypothesis is true.

$$(3) \qquad C_L = \mu_o - \frac{(a + K_E)\sigma}{\sqrt{n}} \quad \text{and} \quad C_R = \mu_o + \frac{(a + K_E)\sigma}{\sqrt{n}}$$

b. For Controlling The β Error Level

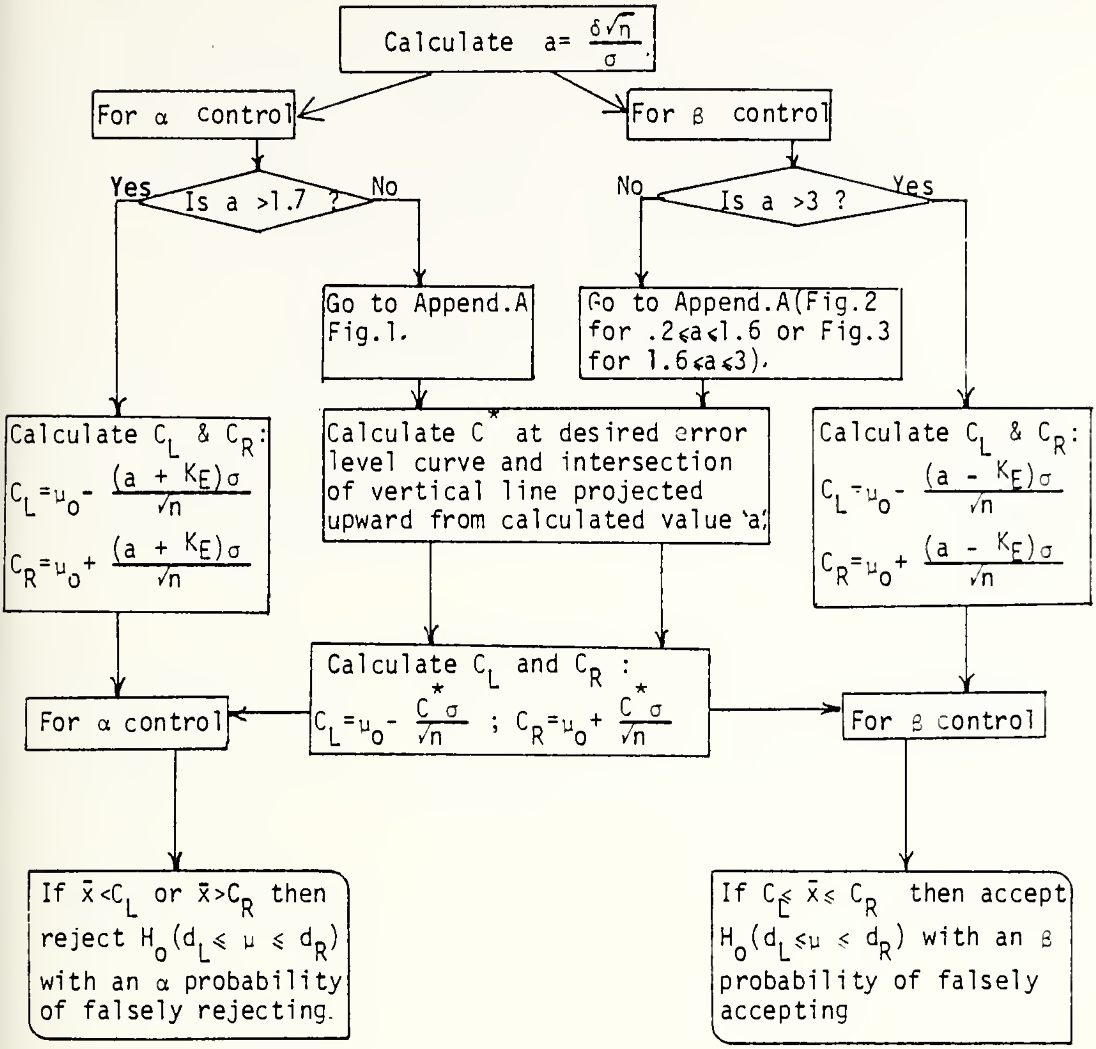
First calculate $a = \frac{\delta\sqrt{n}}{\sigma}$. If "a" is less than or equal to 3, the associated C* value is obtained from Figure A-2 ($.2 \leq a \leq 1.6$) or Figure A-3 ($1.6 \leq a \leq 3$) of Appendix A. The lower (C_L) and upper (C_R) bounds of the acceptance region are then defined using equation 2.

If "a" is greater than 3, the relationship between a and C* becomes linear and equation 4 is used to define the β error level acceptance region. If $C_L \leq \bar{x} \leq C_R$, the hypothesis that the mean is between d_L and d_R is accepted with a probability of falsely accepting equal to β.

$$(4) \qquad C_L = \mu_o - \frac{(a - K_E)\sigma}{\sqrt{n}} \quad \text{and} \quad C_R = \mu_o + \frac{(a - K_E)\sigma}{\sqrt{n}}$$

c. For Estimating Tail Probability (P_T)

The exact value of the tail probability (P_T) cannot be calculated since it depends on the actual value of the population mean (μ). However, the procedure depicted in Figure 2 will provide an estimate of the maximum possible value of P_T for a corresponding value of $\bar{x}$ equal to or more extreme than that observed. The procedure for estimating P_T consists of first calculating the values $a = \frac{\delta\sqrt{n}}{\sigma}$ and



APPROPRIATE K_E VALUES	
α or β Level	K_E
.001	3.09025
.01	2.32635
.025	1.95996
.05	1.64485
.075	1.43953
.1	1.28155
.15	1.03643
.2	.84162
.25	.67449

SYMBOLS

d_L & d_R=Lower and upper test interval values.

$\delta = .5(d_R - d_L)$

$\mu_o = .5(d_L + d_R)$

C_L = Defines lower bound of critical region.

C_R = Defines upper bound of critical region.

Figure 1: Algorithm For Determining α or β Critical Regions for Known σ

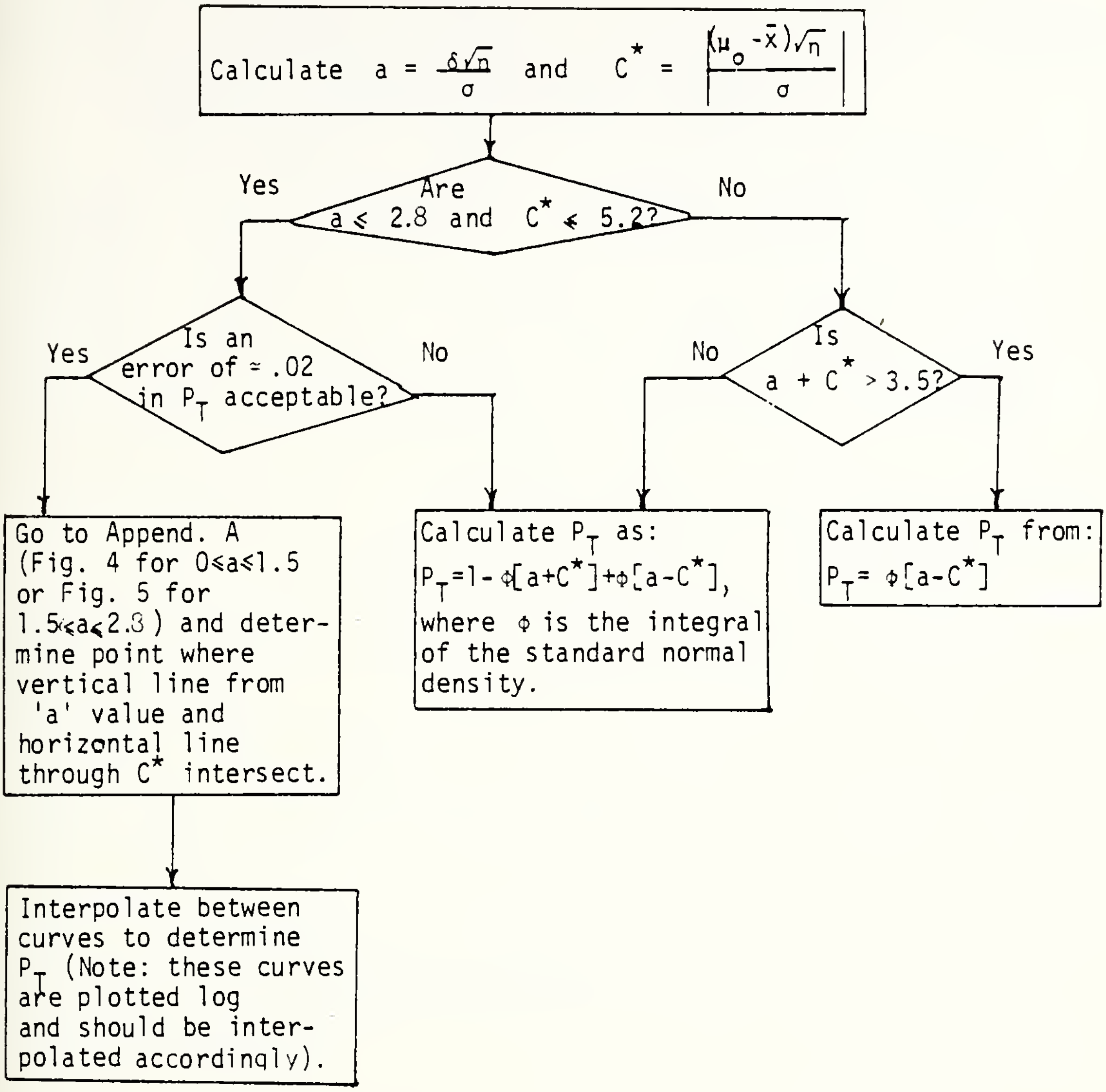


Figure 2: Algorithm For Determining The Tail Probability For σ Known

$C^* = \left| \frac{(\bar{x} - \mu_o)\sqrt{n}}{\sigma} \right|$. These values are then used to estimate P_T by employing the interpolation curves of Appendix A or by direct calculation using the equations provided in Figure 2.

3. Range of Parameter Values Considered

The procedure itself is suitable for all possible parameter values. However, a restriction on the range of parameters covered by the curves and tabulated data was necessary. The range of parameter values was selected in a manner which would provide adequate coverage for the majority of conceivable real-world situations.

a. Curves

1. For α Error Level Control. Parameter ranges covered are α(.01, .025, .05, .075, .1, .15, .2, and .25) and a(0 to 1.7).

2. For β Error Level Control. Parameter ranges covered are β(.01, .025, .05, .075, .1, .15, .2, and .25) and a(.2 to 3).

3. For Estimating P_T. Parameter ranges covered are a(0 to 2.8) and C*(.04 to 5.2).

b. Tables

1. For α Error Level Control. Parameter ranges covered are α(.001, .01, .025, .05, .075, .1, .15, .2, and .25) and a(0 to 3).

2. For β Error Level Control. Parameter ranges covered are β(.001, .01, .025, .05, .075, .1, .15, .2, and .25) and a(0 to 5).

4. Example Applications

a. Example 1

In the production of a certain structural element, a new size has been established as marketable. The expected size of the new element is to be between 16.5 and 17 cm in order to satisfy engineering and management requirements. For example, if the expected size is below 16.5 cm the rejection rate of unacceptable elements will be too high. If the expected size exceeds 17 cm, more material is used than is necessary.

For the first 25 units produced, the average size is 17.03 cm. It is known from previous experience that the element size is normally distributed with a standard deviation equal to .2. In addition, no functional relationship between the mean and standard deviation of the element size has been observed in the range of 10 to 20 cm.

The decision maker is interested in determining if the hypothesis that the expected size is between 16.5 and 17 cm can be rejected with a Type I error equal to .05. The test is conducted with δ equal to .25, μ_o equal to 16.75, and a equal to $\frac{(.25)(5)}{2}$ or 6.25. Since a is greater than 1.7, the rejection region is defined using equation 3, specifically:

$$C_L = 16.75 - \frac{(6.25 + 1.645)(.2)}{5} = 16.434$$

and

$$C_R = 16.75 + .3158 = 17.066.$$

Since $\overline{x}$ is neither greater than C_R or less than C_L, the hypothesis cannot be rejected with a Type I error equal to .05.

b. Example 2

From a sample size of 81 shipping containers selected at random, it is necessary to know if the expected container weight (which appears to be normally distributed) is between 75 and 75.5 kg. The sample average weight and variance are 75.22 and 1.44, respectively. A Type II error equal to .01 is desired. Since the sample size is relatively large, a reasonable estimate of the population variance can be obtained using the sample variance. The test is conducted with δ equal to .25, μ_o equal to 75.25, and a equal to $\frac{(.25)(9)}{1.2}$ or 1.875. Since the value of a is less than 3, a C* value equal to .0726 is obtained from Figure A-3 of Appendix A. Using this value of C*, the values of C_L and C_R obtained from equation 4 are

$$C_L = 75.25 - \frac{(.07263)(1.2)}{9} = 7.25 - .00975 = 75.24$$

and

$$C_R = 75.25 + .00975 = 75.26.$$

Since $\overline{x}$ is not between C_L and C_R, the hypothesis that the mean

is between 75 and 75.5 cannot be accepted with a Type II error equal to .01. However, it may be possible to accept the hypothesis at a somewhat higher risk (β) of falsely accepting. Trying β = .05, the new C* obtained from Figure A-3 of Appendix A is .35 and accordingly C_L = 75.2 and C_R = 75.3. Since $\bar{x}$ is between C_L and C_R, the hypothesis could be accepted with a probability equal to .05 of falsely accepting.

c. Example 3

For the situation of Example 1, the decision maker wants to know for what values of α the hypothesis $16.5 \leq \mu \leq 17$ could be rejected. The answer can be found by estimating the maximum tail probability associated with the observed $\bar{x}$ using the procedure described in figure 2 with $a = 6.25$ and $C^* = \left|\frac{(\bar{x} - \mu_o)\sqrt{n}}{\sigma}\right| = 7$. Since $a + C^* > 3.5$, the estimate of P_T would be $P_T = \Phi[.25 - 7] = .227$. Therefore, an α probability greater or equal to .23 would be required before the hypothesis could be rejected.

B. CASE OF UNKNOWN POPULATION VARIANCE

1. General Remarks

A procedure for situations of unknown population variance which would parallel that of the previously discussed variance known procedure cannot be developed without several stage sampling such as Stein's Procedure (reference 1). However, the previously developed methods can be extended directly to the case of unknown variance provided the null hypothesis is scaled by the standard deviation (see below)

and the noncentral t distribution is used in place of the normal. Details follow.

a. A procedure was developed to test the hypothesis $|\mu - \mu_o| \leq r\sigma$ or equivalently $\frac{|\mu - \mu_o|}{\sigma} \leq r$ where

- μ is the true population mean,
- μ_o is some specified value of interest near which the mean is to be tested, and
- r is the portion of the population σ for which the test is to determine if the true mean is within $r\sigma$ units of μ_o.

b. The procedure can be used to conduct tests about the displacement of the coefficient of variation ($CV = \frac{\sigma}{|\mu|}$) from zero.

2. Procedure Description

The procedure for testing that $|\mu - \mu_o| \leq r\sigma$ is provided in figure 3. For testing that $CV \leq CV_o$, figure 4 should be used. Finally, the method for estimating P_T is provided in figure 5.

As the sample size gets large, the ratio $\frac{C}{\sqrt{n}}$ converges to the test value of r. To take advantage of this result, the curves for α error level control are presented in terms of the value $\frac{C}{\sqrt{n}}$ instead of just C. This provides an indication of the value of r and the sample size n for which the σ^2 unknown curves become close to those of the σ^2 known case. However, since the method of estimating P_T requires repeated table entry and interpolation, the critical values presented in the tables of Appendix B are in terms of C directly. A summary of the procedure follows.

a. For Testing That $|\mu - \mu_o| \leq r\sigma$

Select the desired α or β error level. Consult the corresponding curves of Appendix A or tables of Appendix B. If the curves are used, multiply the value obtained for $\frac{C}{\sqrt{n}}$ by the sample size (n). If the tables are used, determine the corresponding value of C directly for the subject values of r and DF. Calculate the statistic

$$\hat{r} = \left| \frac{(\bar{x} - \mu_o)\sqrt{n}}{\sqrt{\hat{\sigma}^2}} \right| .$$

If the test is to control the α error level then reject the hypothesis, with a Type I error equal to α, if the value of $\hat{r}$ is greater than the C value determined from the α curves or tables. For a test to control the β error level accept the hypothesis with a Type II error equal to β if the value of $\hat{r}$ is less than or equal to the C value obtained from the 1- β tables.

b. For Testing That $CV \leq CV_o$

To test the null hypothesis that the coefficient of variation does not exceed CV_o at the α level of significance, one need only apply a role reversal technique to the above procedure. The set equivalences

$$(CV \leq CV_o) = \left(\frac{\sigma}{|\mu|} \leq CV_o\right) = \left(\frac{|\mu|}{\sigma} \geq \frac{1}{CV_o}\right)$$

illustrate the fact that the hypothesis of interest is one of the alternate hypothesis treated previously, and can be managed by reversing the role and interpretation of α and

β error level control from the previous test for $|\mu - \mu_o| \leq r\sigma$.

1. <u>For Controlling The α Error Level</u>. Obtain the C value corresponding to the subject values of r (equal to $\frac{1}{CV_o}$) and DF from the table of Appendix B associated with the value 1-α. Calculate the statistic

$$\hat{r} = \left|\frac{\bar{x}\sqrt{n}}{\sqrt{\hat{\sigma}^2}}\right|.$$

If $\hat{r} < C$, reject the hypothesis that $CV \leq CV_o$ with a Type I error equal to α.

2. <u>For Controlling The β Error Level</u>. Obtain the C value corresponding to the test values of r and DF from the curves of Appendix A associated with the value β (i.e., for β = .01, consult the curves for an α = .01). Calculate the statistic $\hat{r}$. If $\hat{r} \geq C$, accept the hypothesis with a Type II error = β.

c. For Estimating P_T

The actual value of P_T associated with the observed value of $\hat{r}$ will depend upon the true value of

$$\left|\frac{(\mu - \mu_o)\sqrt{n}}{\sigma}\right|.$$

To obtain an estimate of the range of possible values for P_T, the procedure detailed in figure 5 is used to calculate a value for P_T corresponding to r set at zero and r set at the test value (r). The actual value of P_T will be between these two extremes.

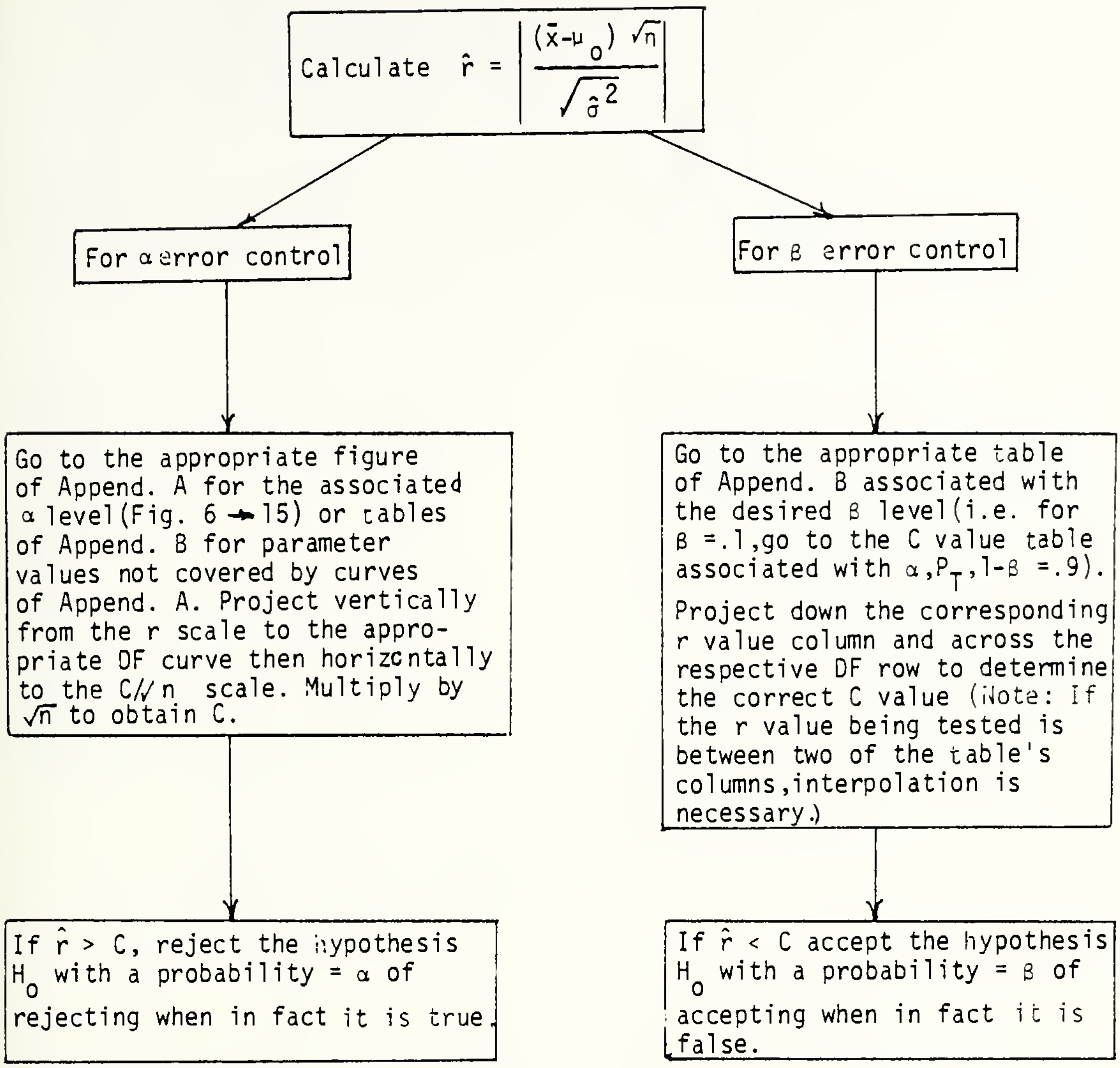


Figure 3: Algorithm For Testing The Hypothesis $|\mu - \mu_o| \leq r\sigma$

Calculate $\hat{r} = \left|\frac{\bar{x}\sqrt{n}}{\sqrt{\hat{\sigma}^2}}\right|$

For controlling α error level

Go to the appropriate β table of Append. B (Tables 3 → 41) which corresponds to an β value equal to the desired α level (i.e. for α=.1, go to the C critical value table associated with 1-β =.9). Project down the corresponding r value column and across the respective DF row to determine the correct C value. [Note : If the r value being tested is between two of the table's columns , interpolate for C by:

$$C = C_{Left} + \left(\frac{r_{Test} - r_{Left}}{r_{Right} - r_{Left}}\right)(C_{High} - C_{Low})$$

If $\hat{r} < C$, reject the hypothesis $CV \leq CV_0$ with probability α of rejecting when in fact it is true.

For controlling β error level

Go to the appropriate α figure of Append. A (Fig.6→15) which corresponds to an α value equal to the desired β value(i.e.for β =.01, go to the α=.01 curves of figure 6 or 7). Project vertically from the r scale to the appropriate DF curve then horizontally to the $C/\sqrt{n}$ scale. Multiply by $\sqrt{n}$ to get C [Note : For parameter values not covered by the curves ,go to the tables of Append. B which provide C directly , instead of $C/\sqrt{n}$.]

If $\hat{r} > C$, accept the hypothesis $CV \leq CV_0$ with probability β of accepting when in fact it is false.

Figure 4: Algorithm For Testing The Hypothesis $CV \leq CV_0$

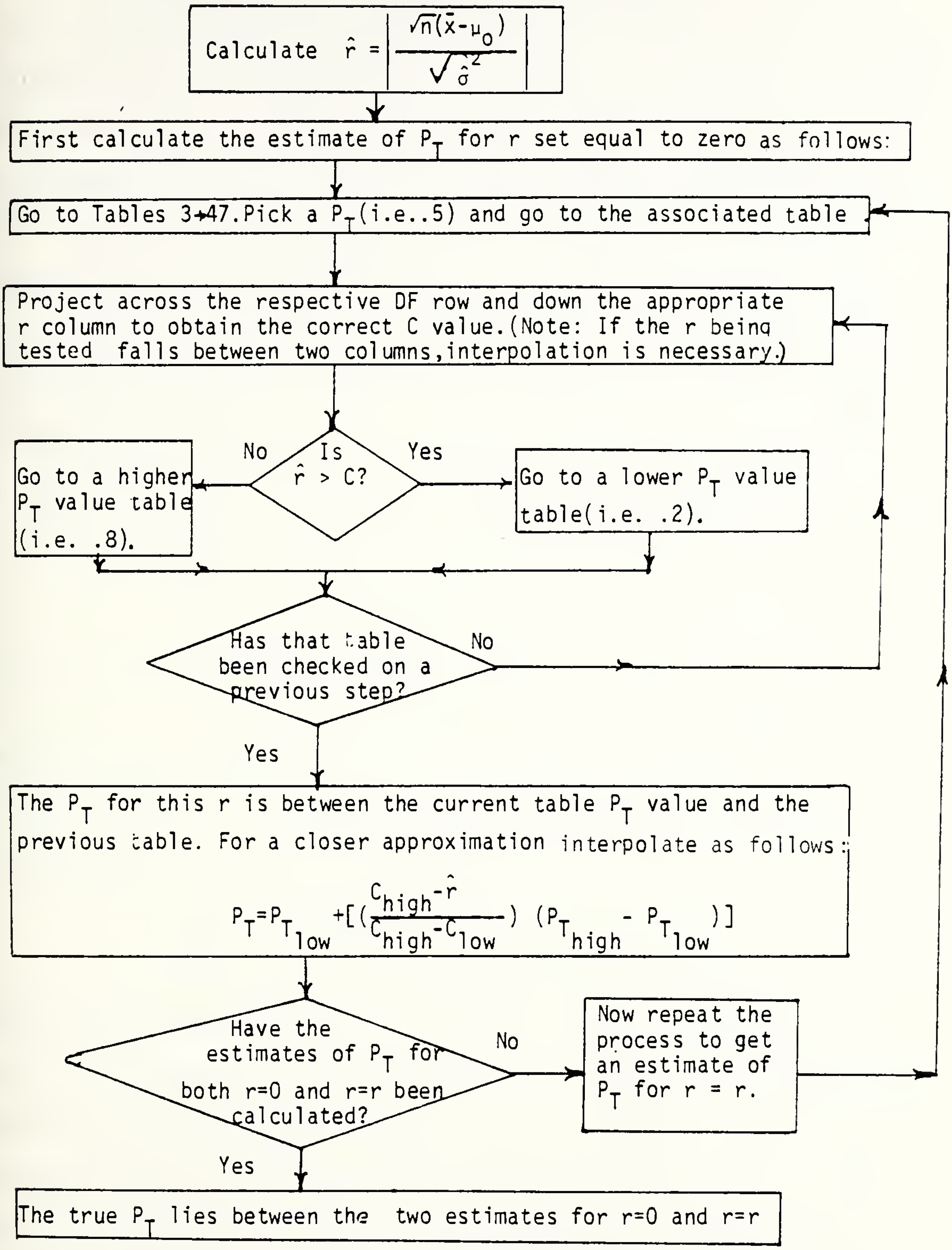


Figure 5: Algorithm For Estimating P_T For σ Unknown

3. <u>Range of Parameter Values Considered</u>

Two general levels of r values, along with selected incrementation, were chosen to parallel the range considered applicable in the majority of situations. For example, in most cases where the test of interest is that $|\mu - \mu_o| \leq r\sigma$, r would range between zero and 1. Conversely, most tests concerning the coefficient of variation would require that $.143 \leq CV_o \leq 1$ (or equivalently, $7 \geq r \geq 1$). However, the critical values (C) for the total range of r (i.e., o to 7) provided in the curves and tables can be used for either test. The specific parameter ranges covered were:

a. Curves

Curves are provided for α error level control for both low and high values of r.

1. <u>For Low r Values ($0 \leq r \leq 1$).</u> Curves are provided for α equal to .01, .025, .05, .1, and .2.

2. <u>For High r Values ($1 \leq r \leq 7$).</u> Curves are provided for α equal to .01, .025, .05, .1, and .2.

b. Tabulated Data

The same tables are used to present critical values for both α and β error level control and for estimating P_T. To obtain C values for β error control, the tables associated with α and P_T equal to $1-\beta$ are used. The values covered by the tables are α, P_T, or $1-\beta$ equal to .01, .025, .05, .1, .2, .3, .4, .5, .6, .7, .8, .9, .95, .975, and .99. For each value of α, P_T, and $1-\beta$, three tables are provided to cover the range of r from 0 to 7.

4. Example Applications

a. To Test That $|\mu - \mu_o| \leq r\sigma$

It is necessary to determine if the output of a new system is between 11.75 and 12 units. The standard deviation in the output of the new system is believed (with confidence) to be between 2/3 and 3/4 of that of the old system (σ = 1.5). Using the conservative estimate of the improvement in the system deviation (i.e., 3/4), the test parameter r would be set equal to $\frac{(12 - 11.75)}{(2)(.75)(1.5)}$ or .111. For the first 15 units, the values of the sample mean and deviation were 11.68 and .3, respectively. The desired level of significance (α) is .05.

The test is conducted with μ_o equal to 11.875 and $\hat{r}$ equal to 2.517. Using figure A-10 of Appendix A, $\frac{C}{\sqrt{n}}$ is determined to be .6, and accordingly, the critical value equals (.6)($\sqrt{15}$) or 2.324. Since $\hat{r}$ is greater than C, the hypothesis is rejected with a Type I error equal to .05.

b. To Test That $CV \leq CV_o$

A relationship is known to exist between the mean and standard deviation of the purity of a certain chemical product. A new method of processing is being considered to improve the expected purity of the product. The decision maker is interested in determining if the same degree of quality control would be obtained with the new process as with the current method which provide a standard deviation equal to .18 of the mean (i.e., a coefficient of variation equal to .18).

Since a relationship between the mean and standard deviation is known to exist, and only 15 batches of the product have been produced by the new process, the population variance is considered unknown. The mean purity of the first 15 batches was 4.6 parts per million with a sample variance equal to .25. The decision maker is concerned that if he does not convert to the new method, he will be rejecting, with a probability (α) equal to .05, an opportunity for a better product. The rejection region associated with a value of r equal to 5.56 (i.e., $\frac{1}{.18}$) is found by consulting the critical value table with $1-\beta$ equal .95. Interpolating between the table columns for r equal to 5 and 6, a value of C equal to 17.69 is obtained. The value of $\hat{r}$ is calculated to be 35.63. Since $\hat{r}$ is greater than C, the hypothesis that the new process provides a quality control equal to or greater than the current method cannot be rejected with a Type I error equal to .05.

APPENDIX A

CURVES FOR DETERMINING α OR β CRITICAL VALUES AND TAIL PROBABILITY (P_T)

I. GENERAL

The curves provided within were developed to simplify procedural calculations in lieu of the tabulated data of Appendix B. They do not cover the total parameter ranges of the data in Appendix B but were designed to maximize interpolation precision while covering what is felt to be the majority of applicable situations. For those cases which are subject to parameter values outside the range of the curves, Appendix B should be used. Figures A-1 through A-5 are relevant to the σ^2 known procedure. Figures A-6 through A-15 deal with the σ^2 unknown situation.

II. ACCURACY

The accuracy achievable in using the curves vs. using the associated tables depends on the interpolation prowess of the individual user. However, to provide a general idea of the accuracy which may be expected, the following statements are considered germane.

A. σ^2 UNKNOWN PROCEDURE CURVES

a. C* Values For α or β Error Level Control

Accurate interpolation to the third digit is possible (i.e., C^*_{true} equals $C^*_{interpolated} \pm .005$).

b. P_T Values

Because of the semi log scale and interpolation between curves, the accuracy in the interpolated P_T values is expected to be $\approx \pm .02$ for $.1 \leq P_T \leq .9$, and $\pm .005$ for $P_T < .1$ or $P_T > .9$.

B. σ^2 UNKNOWN PROCEDURE CURVES

a. Curves For The Range of r From 0 to 1

Interpolation accurate to the third digit is possible.

b. Curves For The Range of r From 1 to 7

Interpolation accurate to the second digit is possible.

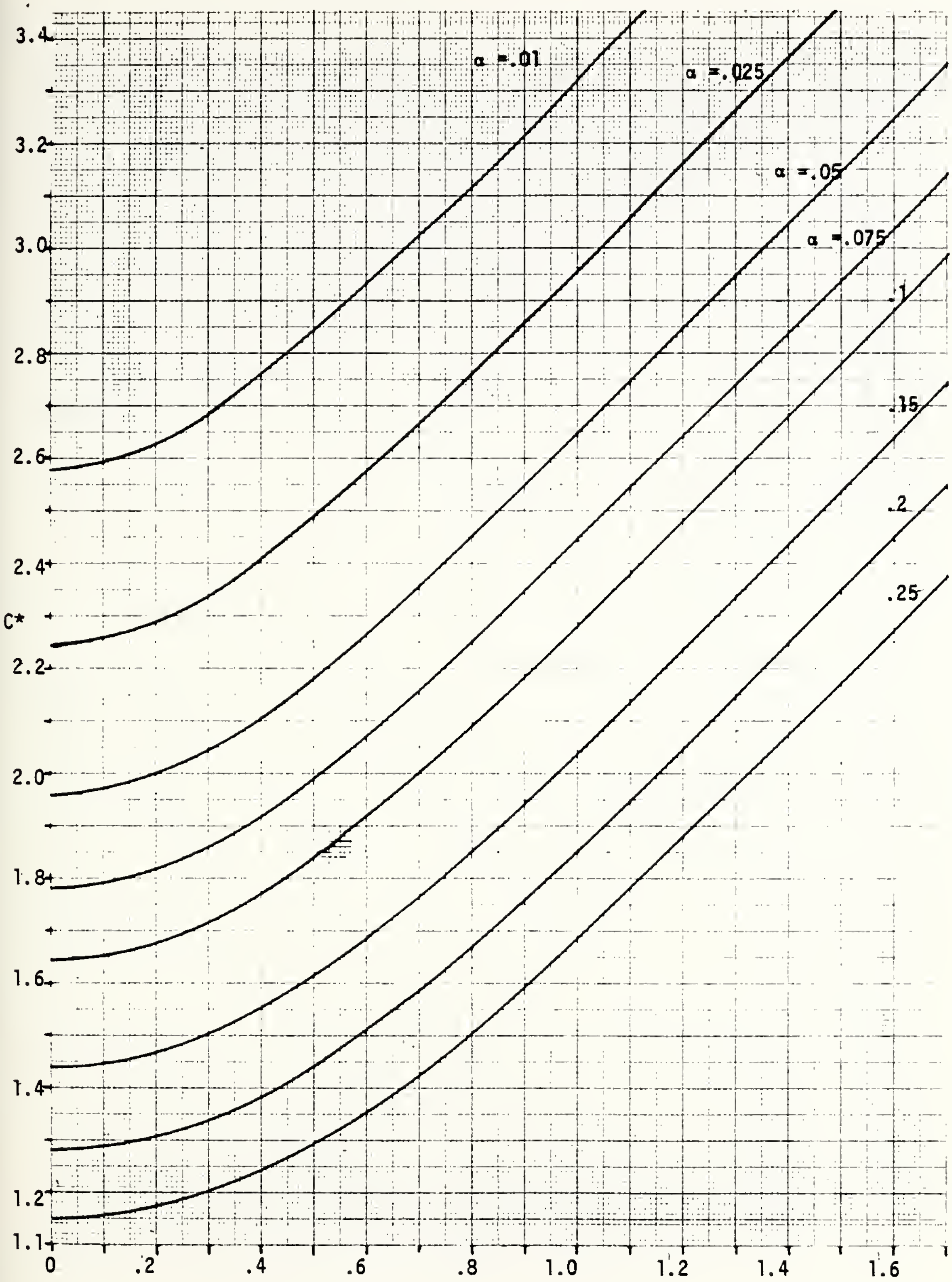


Figure A-1: C* Values For α Error Level Control With σ Known; ($0 \leq a \leq 1.7$)

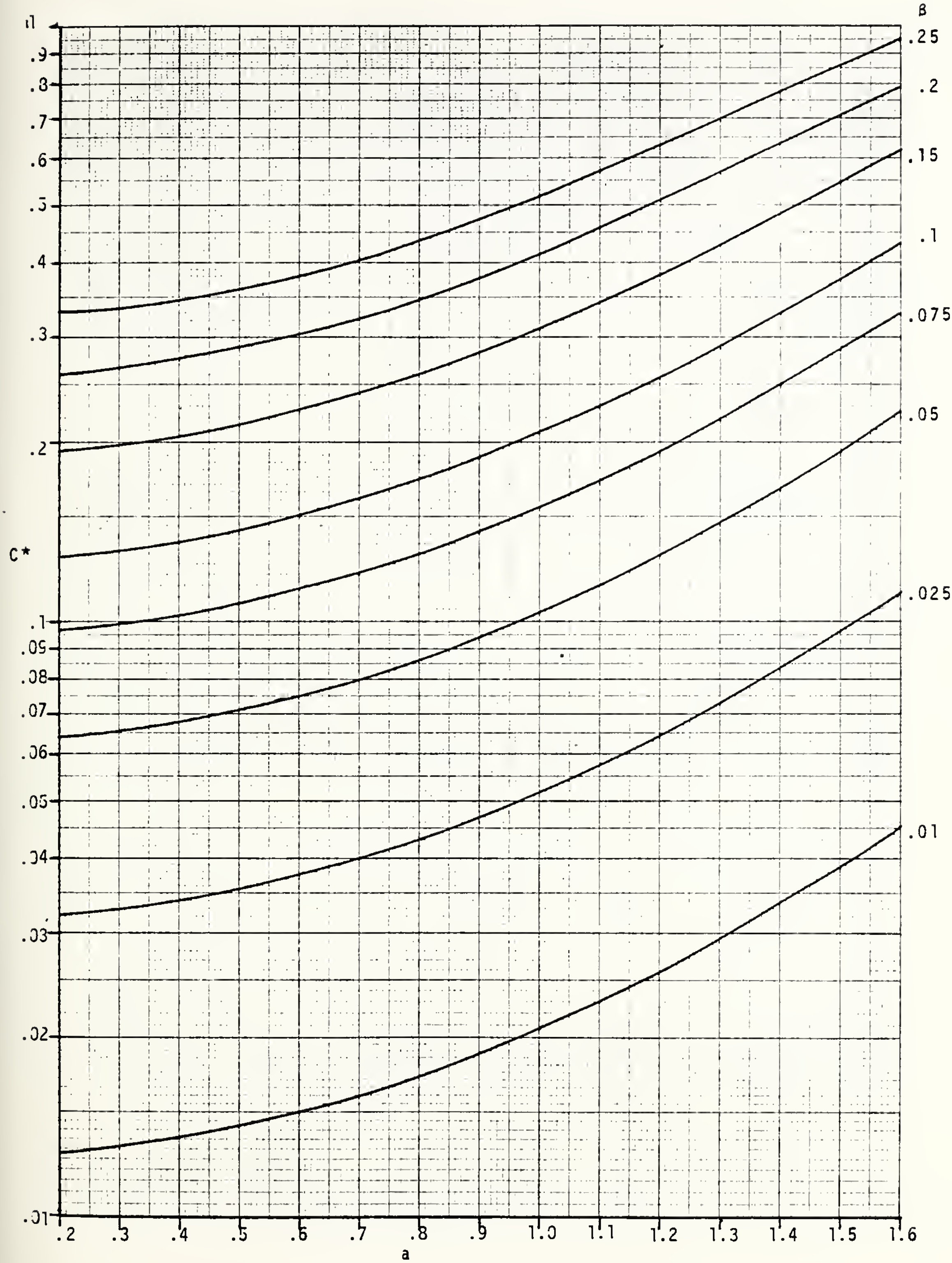


Figure A-2: C* Values For β Error Level Control With σ Known; (.2 < a < 1.6)

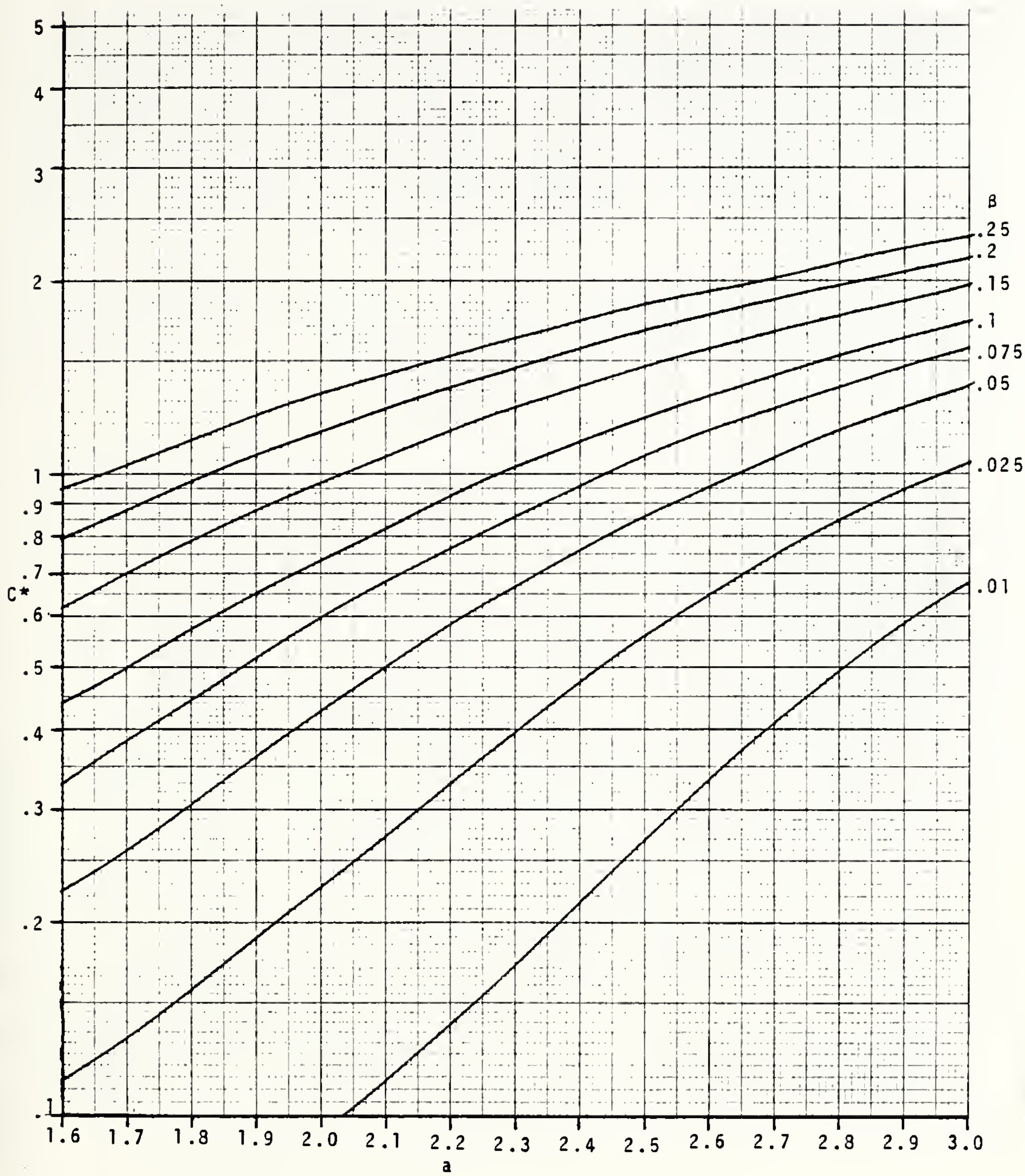


Figure A-3: C* Values For β Error Level Control With σ Known; ($1.6 \leq a \leq 3$)

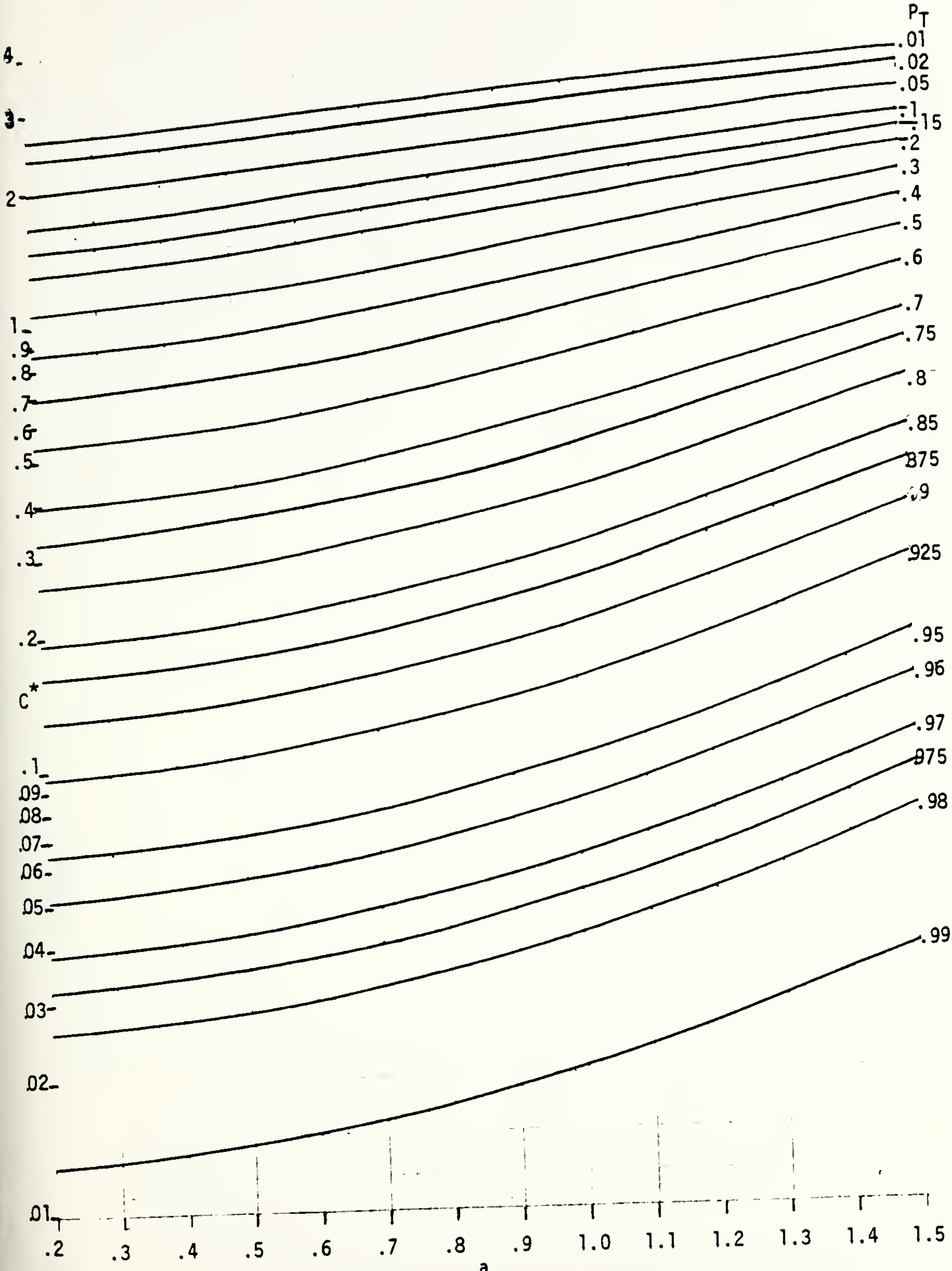


Figure A-4: Tail Probability for σ Known with $.2 \leq a \leq 1.5$

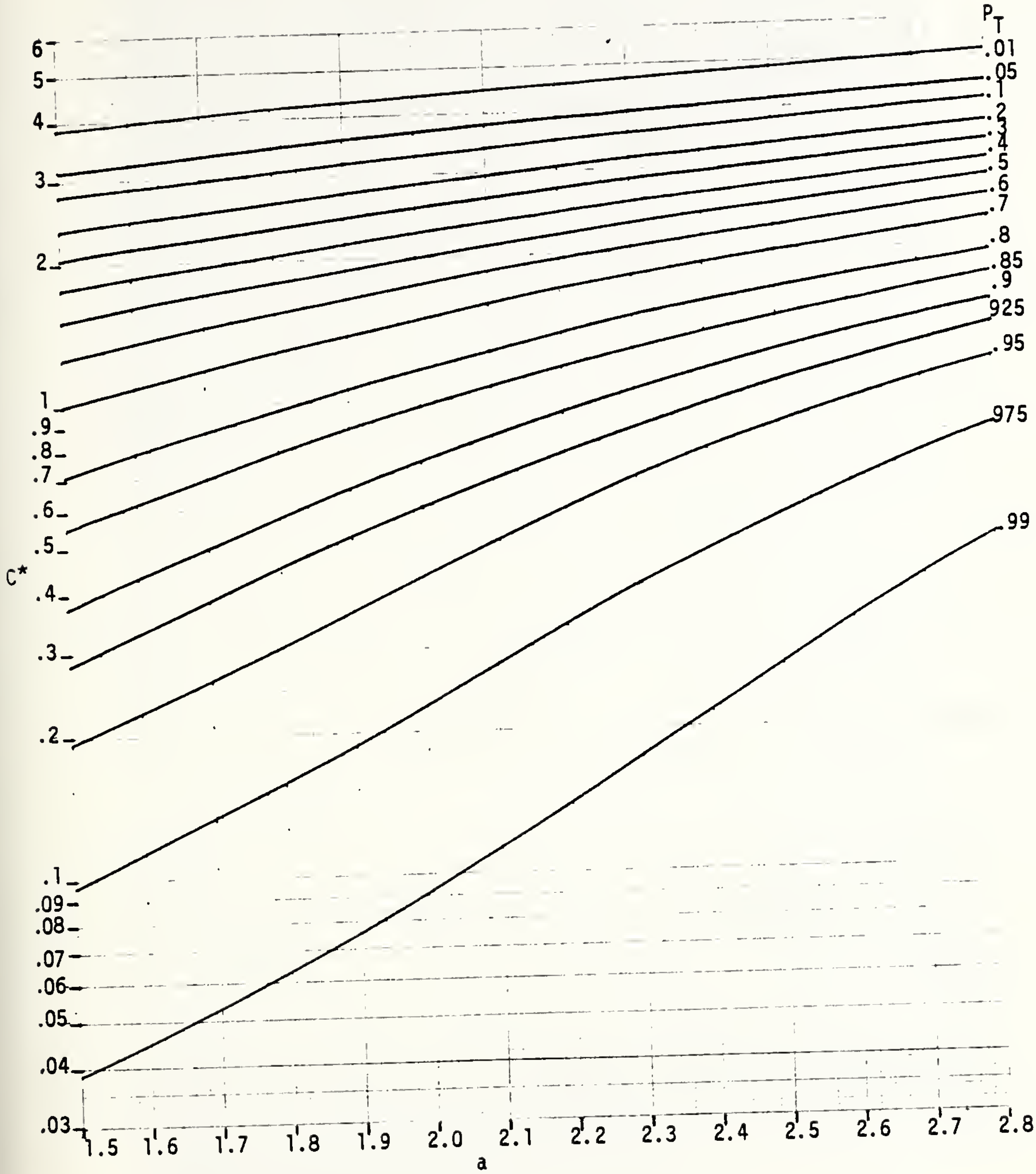


Figure A-5: Tail Probability For σ Known With $1.5 \leq a \leq 2.8$

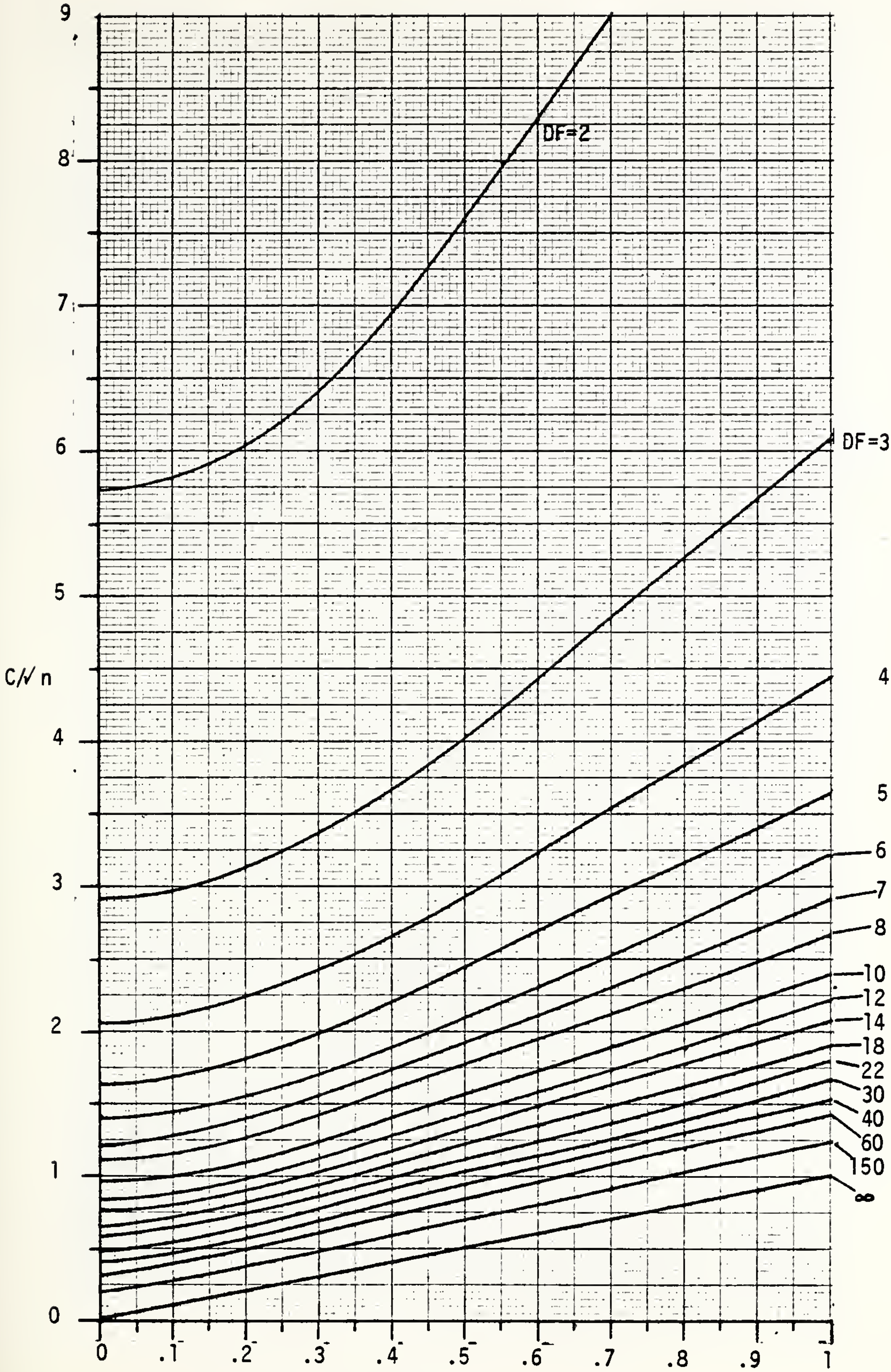


Figure A-6: $C/\sqrt{n}$ Values For σ Unknown With α, P_T, or $1-\beta = .01$; ($r \leq 1$)

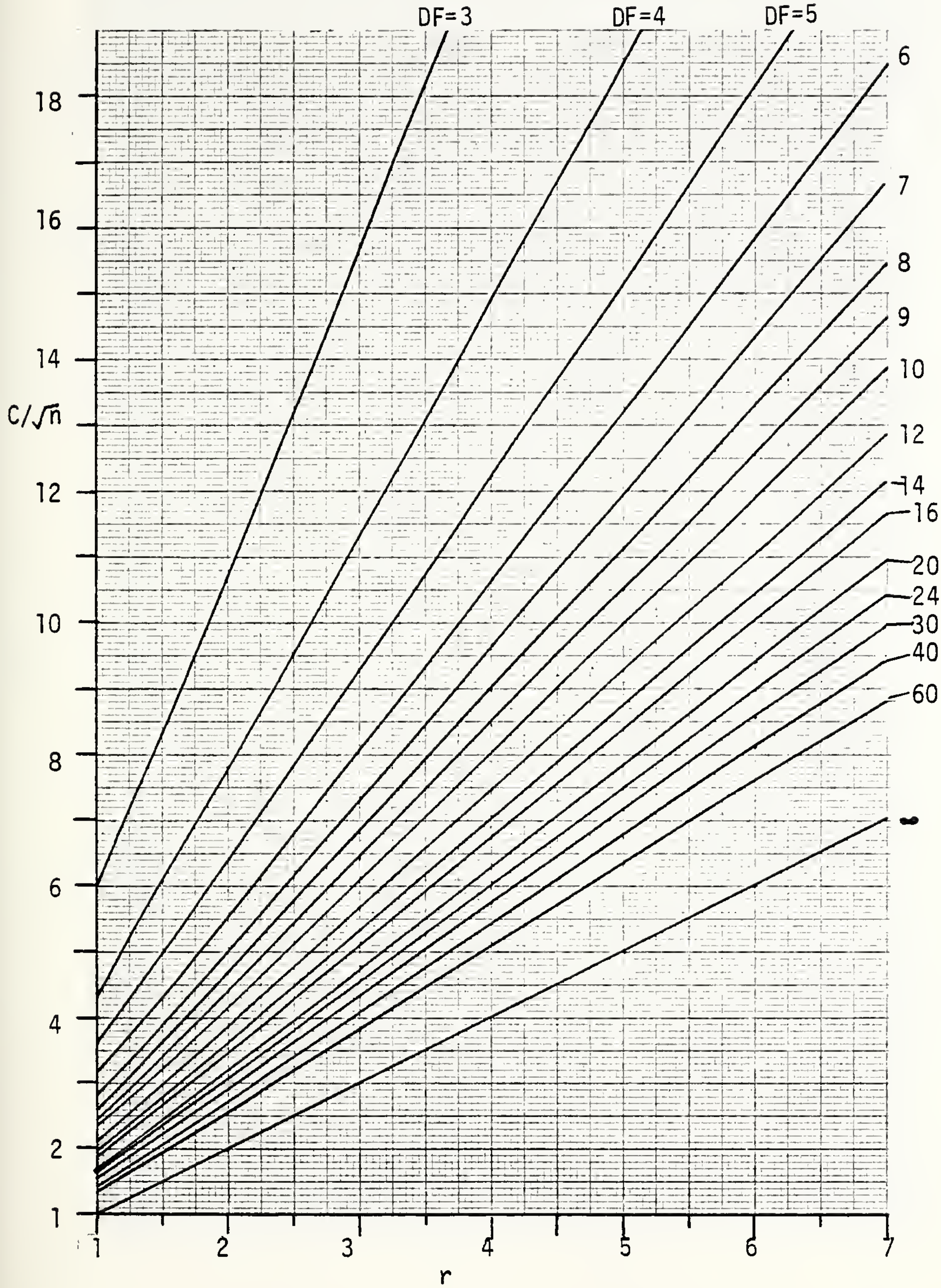


Figure A-7: $C/\sqrt{n}$ Values for σ Unknown With α, P_T, or $1-\beta = .01$; $(r \geq 1)$

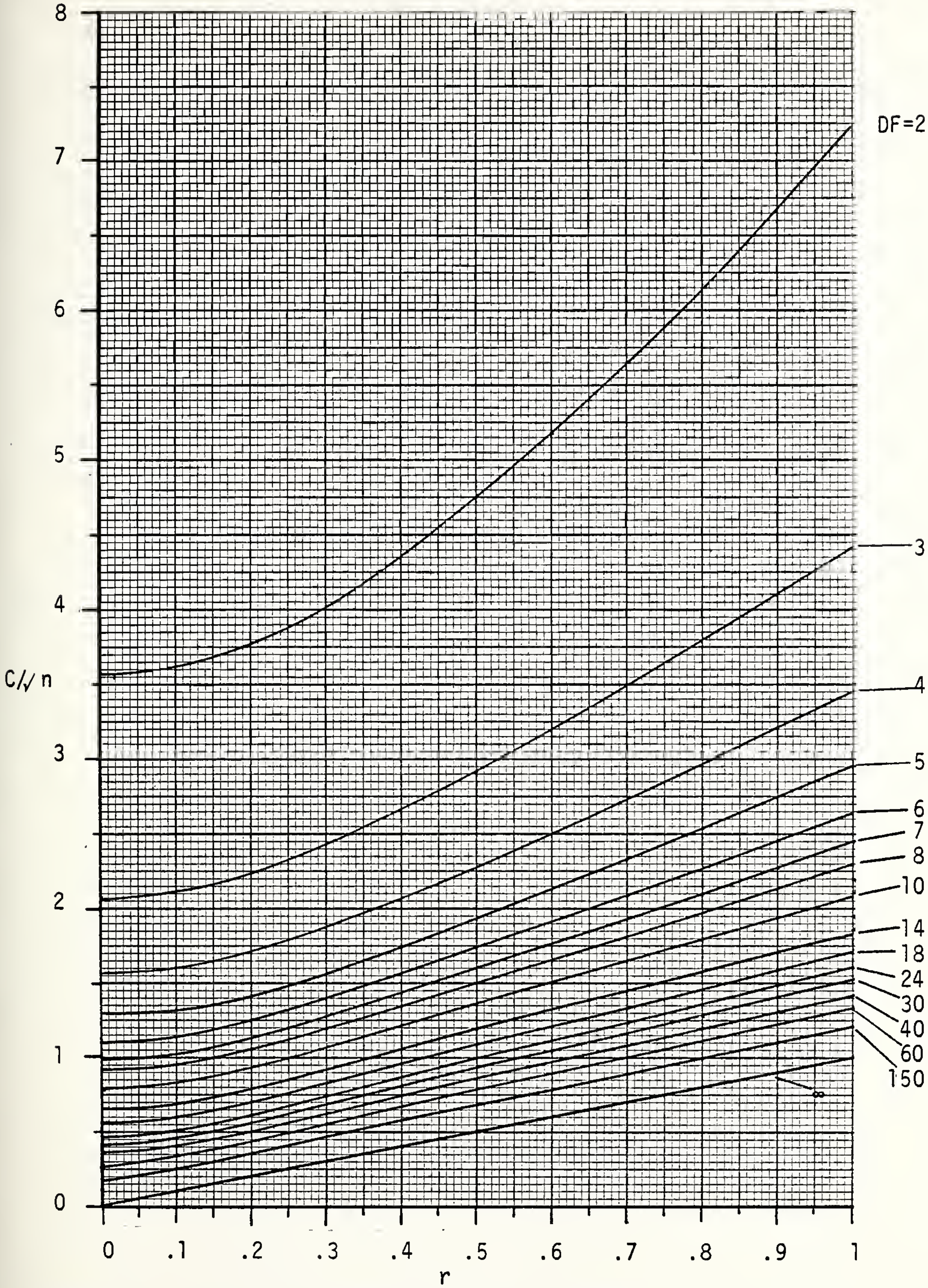


Figure A-8: $C/\sqrt{n}$ Values For σ Unknown With α, P_T, or $1-\beta$ = .025; ($r \leq 1$)

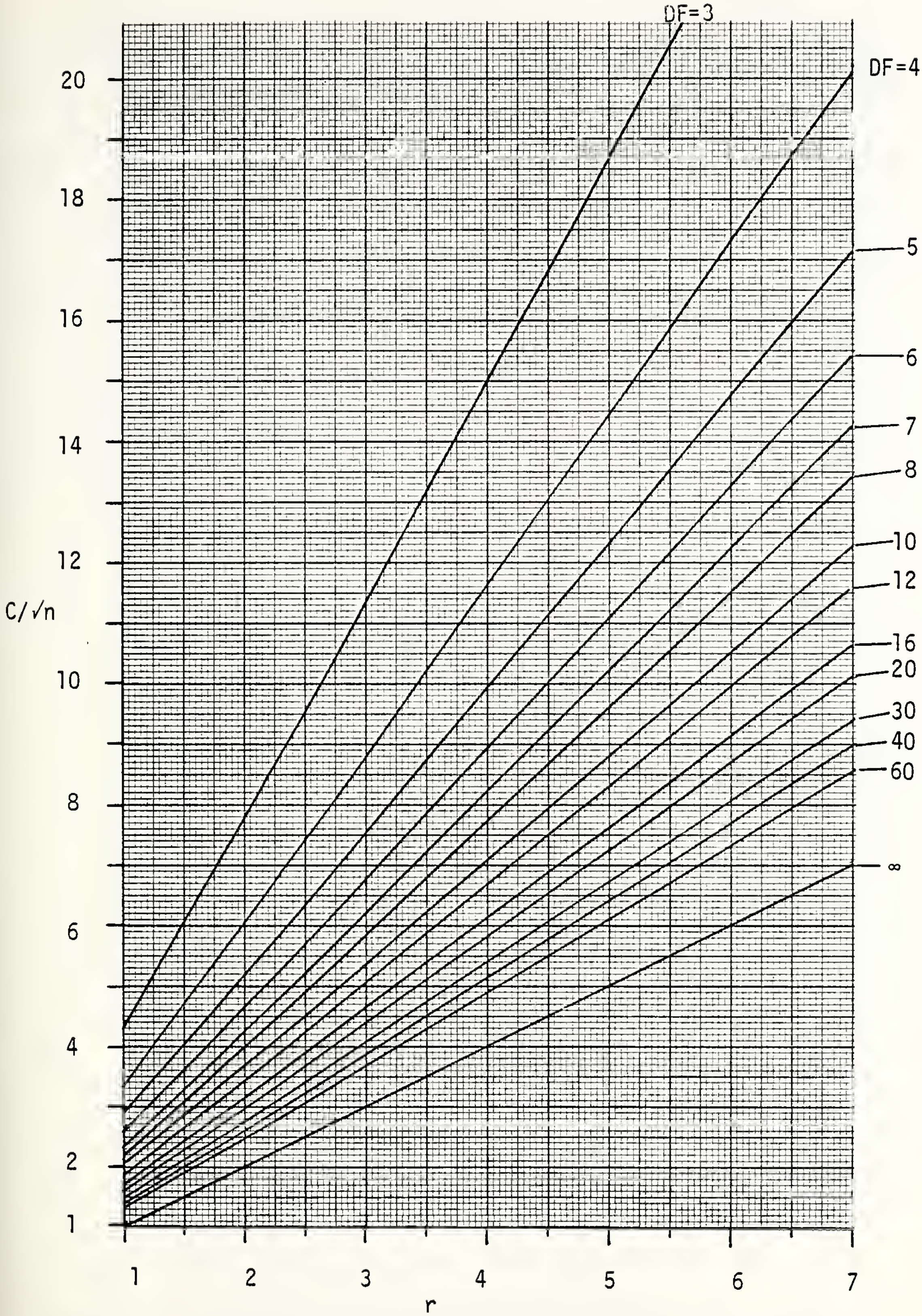


Figure A-9: $C/\sqrt{n}$ Values For σ Unknown With α, P_T, or $1-\beta = .025$; ($r \geq 1$)

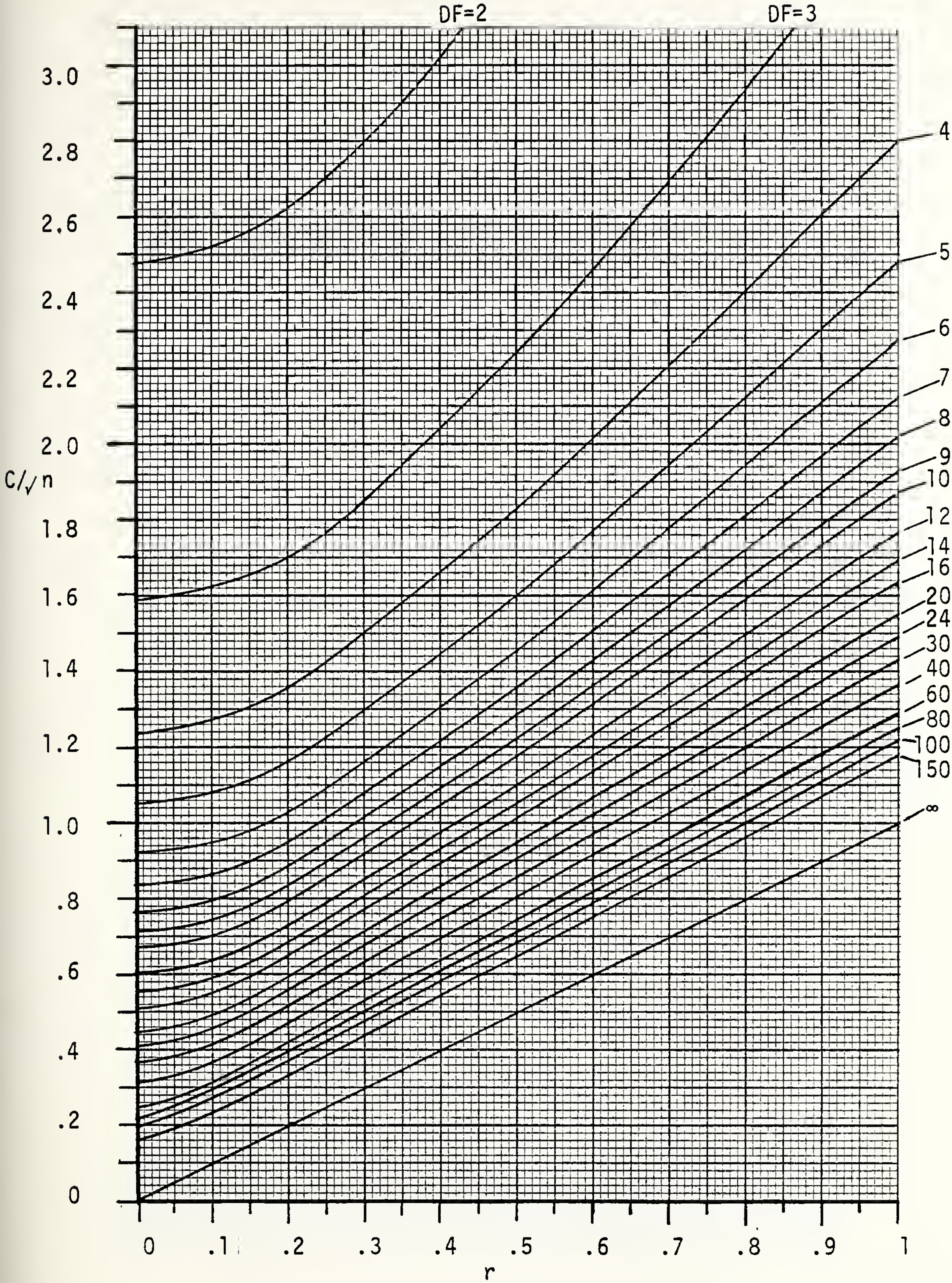


Figure A-10: $C/\sqrt{n}$ Values For σ Unknown With α, P_T, or $1-\beta = .05$; ($r \leq 1$)

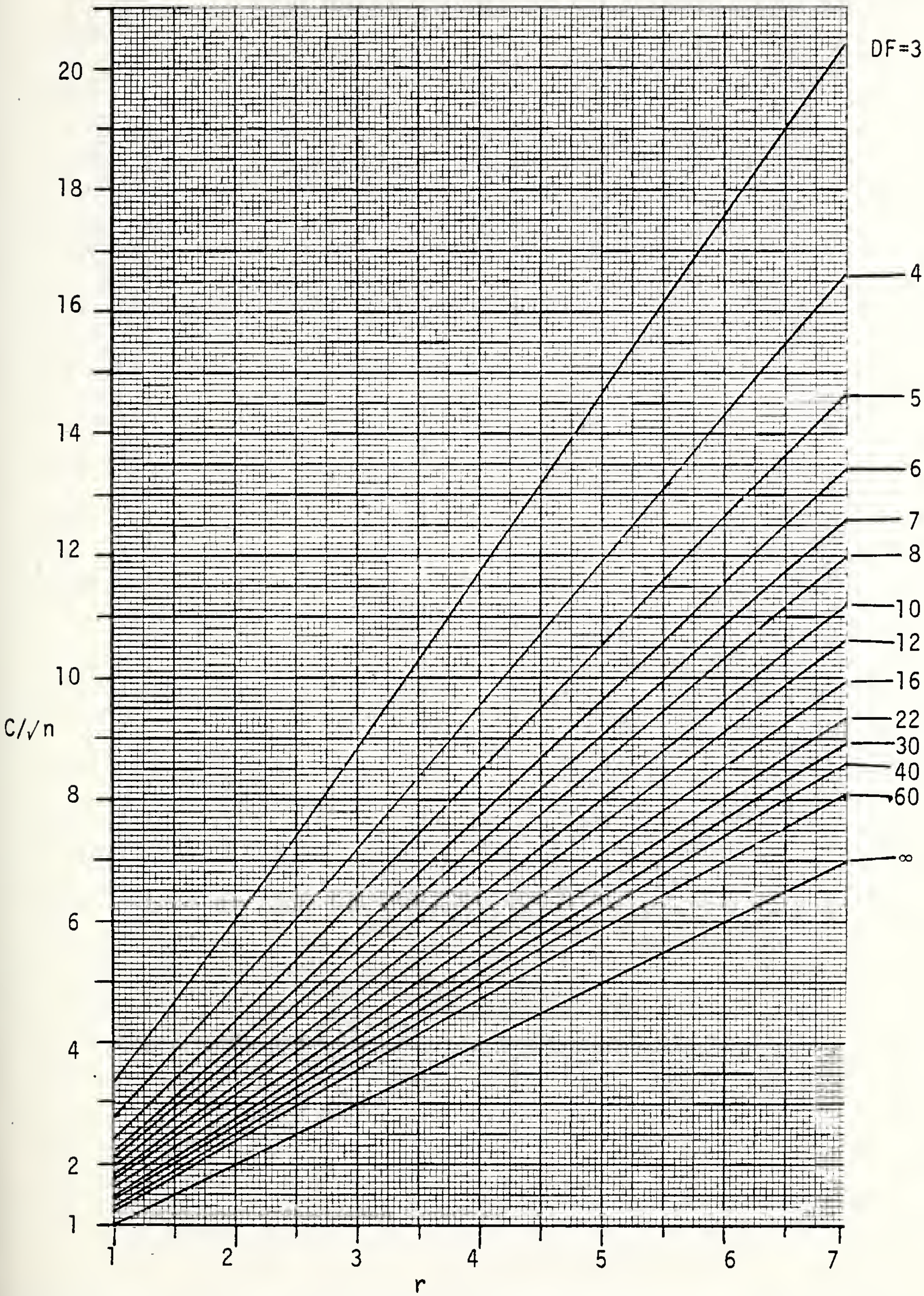


Figure A-11: $C/\sqrt{n}$ Values For σ Unknown With α, P_T, or $1-\beta$ = .05; ($r \geq 1$)

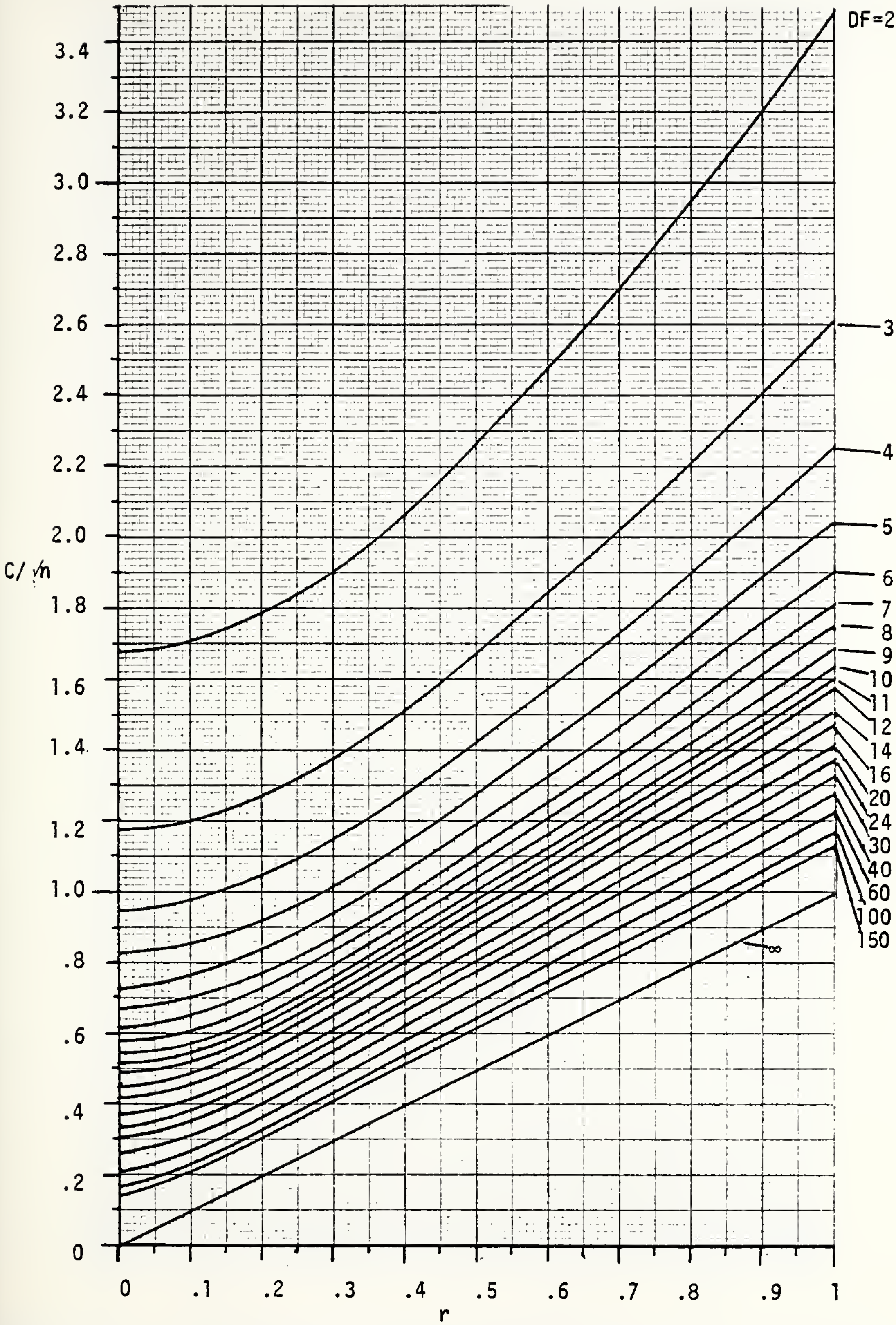


Figure A-12: $C/\sqrt{n}$ Values For σ Unknown With α, P_T, or $1-\beta = .1$; ($r \leq 1$)

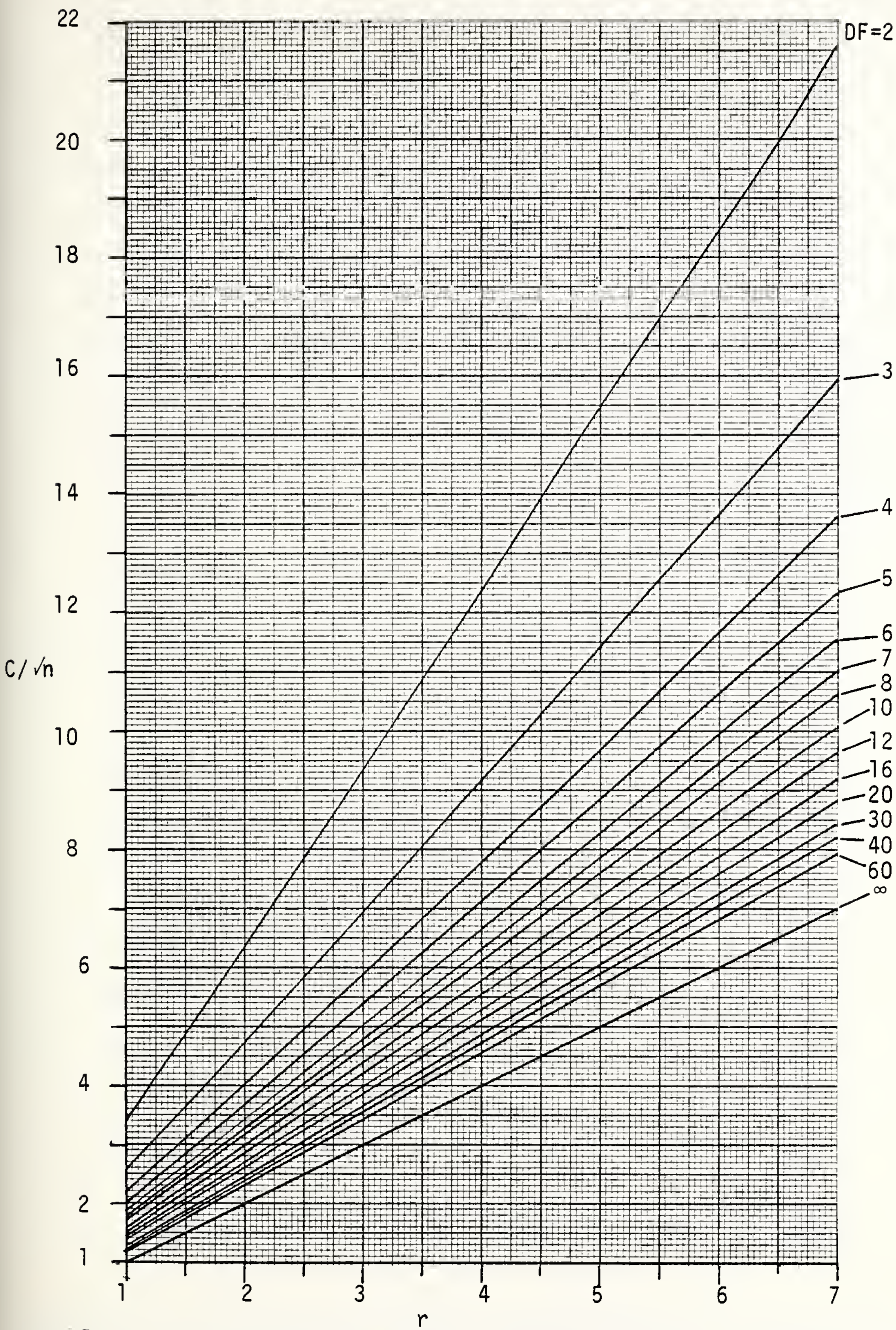


Figure A-13: $C/\sqrt{n}$ Values For σ Unknown With α, P_T, or $1-\beta = .1$ $(r \geq 1)$

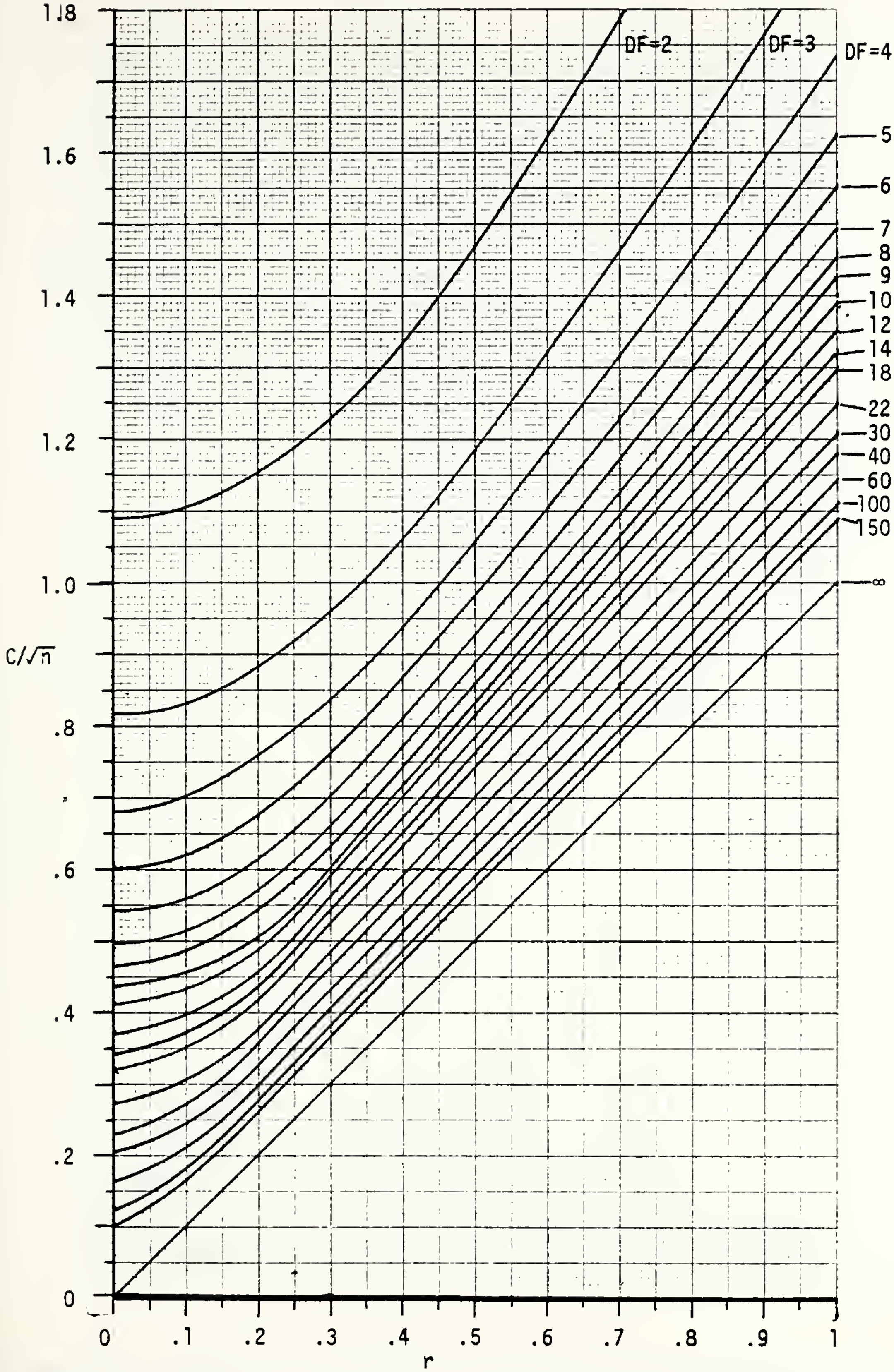


Figure A-14: $C/\sqrt{n}$ Values For σ Unknown With α, P_T, or $1-\beta = .2$; $(r \leq 1)$

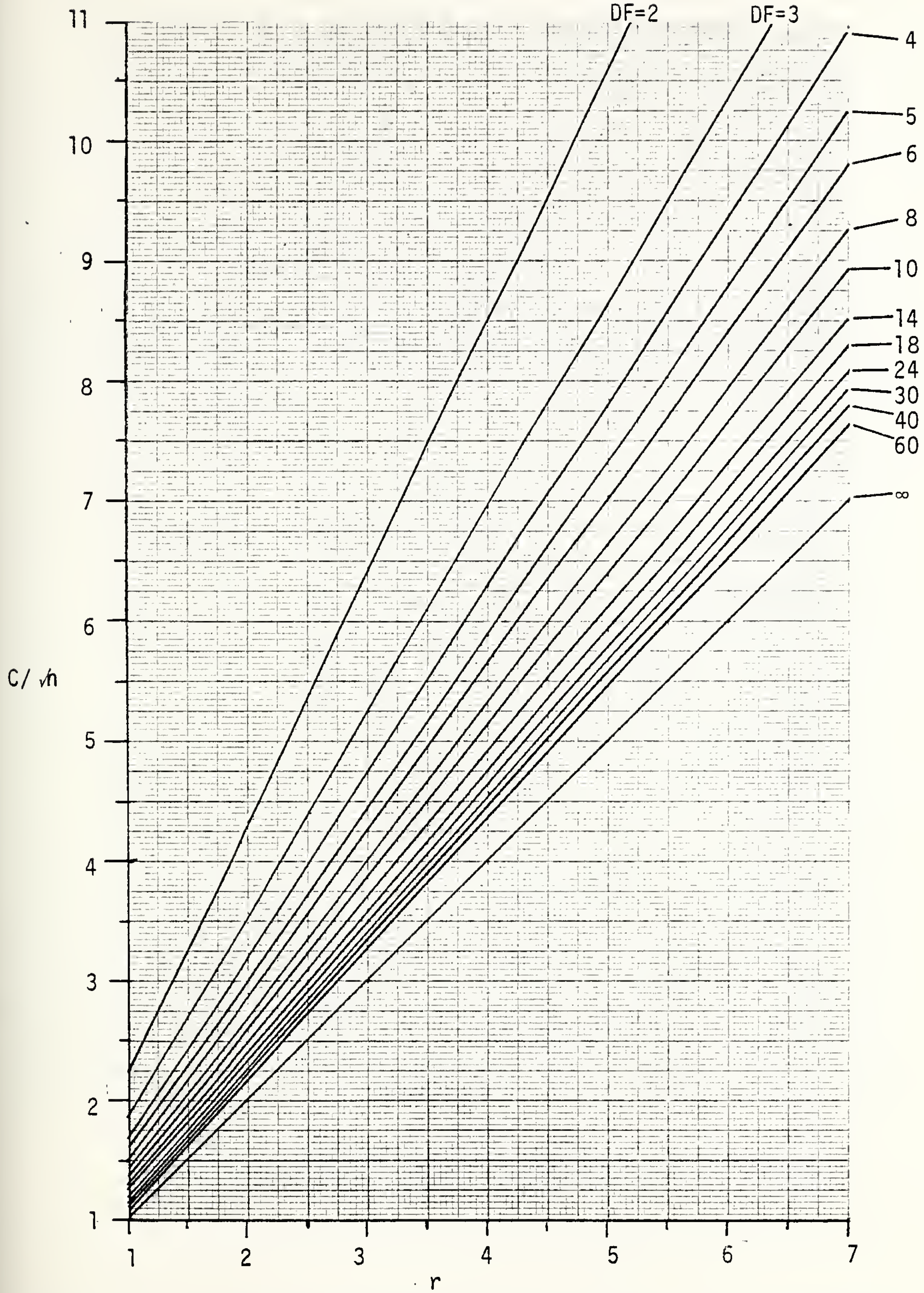


Figure A-15: $C/\sqrt{n}$ Values For σ Unknown With α, P_T, or $1-\beta = .2$; $(r \geq 1)$

APPENDIX B

TABLES OF α OR β CRITICAL VALUES AND P_T

a \ α	0,001	0,01	0,025	0,05	0,075	0,1	0,15	0,2	0,25
0,0	3,29056	2,57583	2,2414	1,95996	1,78046	1,64485	1,43953	1,28155	1,15035
0,1	3,30670	2,5886	2,25254	1,96972	1,78934	1,65306	1,44672	1,28796	1,1561
0,15	3,32634	2,60426	2,26629	1,98182	1,80037	1,66327	1,45569	1,29596	1,1533
0,2	3,35258	2,62564	2,28519	1,99855	1,81567	1,67748	1,4682	1,30715	1,17338
0,25	3,38453	2,65224	2,30893	2,01971	1,83511	1,69558	1,48422	1,32152	1,18634
0,3	3,42115	2,68348	2,33711	2,04505	1,85851	1,71745	1,50367	1,33903	1,2022
0,35	3,46146	2,71871	2,36928	2,07426	1,88565	1,74092	1,52647	1,35964	1,22092
0,4	3,50459	2,75732	2,40496	2,10699	1,91625	1,77179	1,55240	1,3833	1,24249
0,45	3,54981	2,79867	2,44364	2,14286	1,95003	1,80382	1,58159	1,40991	1,26608
0,5	3,59654	2,84223	2,48484	2,18148	1,98666	1,83875	1,6136	1,43937	1,29401
0,55	3,64434	2,88751	2,52811	2,22245	2,0258	1,87628	1,6483	1,47153	1,32301
0,6	3,69288	2,93409	2,57304	2,26539	2,0671	1,91612	1,68547	1,50623	1,35616
0,65	3,74193	2,98166	2,61927	2,30996	2,11024	1,95795	1,72485	1,54327	1,39092
0,7	3,79131	3,02996	2,66652	2,35583	2,15491	2,00147	1,76618	1,58244	1,42793
0,75	3,84091	3,07877	2,71453	2,40275	2,20082	2,04642	1,8092	1,62352	1,467
0,8	3,89066	3,12796	2,76311	2,45047	2,24773	2,09252	1,85366	1,66626	1,50792
0,85	3,9405	3,17741	2,81211	2,4988	2,29542	2,13955	1,89933	1,71044	1,55048
0,9	3,9904	3,22704	2,86141	2,5476	2,34371	2,18733	1,94598	1,75584	1,59447
0,95	4,04034	3,27679	2,91093	2,59675	2,39247	2,23568	1,99342	1,80224	1,63368
1,0	4,09031	3,32663	2,9606	2,64615	2,44158	2,28447	2,0415	1,84947	1,67531
1,05	4,14028	3,37653	3,01038	2,69573	2,49094	2,33359	2,09006	1,89735	1,72293
1,1	4,19027	3,42646	3,06024	2,74544	2,54049	2,38297	2,13901	1,94577	1,78075
1,15	4,24026	3,47642	3,11014	2,79524	2,59018	2,43252	2,18824	1,9946	1,82925
1,2	4,29026	3,52639	3,16007	2,84511	2,63997	2,48221	2,23769	2,04373	1,87777
1,25	4,34026	3,57637	3,21003	2,89502	2,68982	2,532	2,2873	2,0931	1,92683
1,3	4,39025	3,62636	3,26001	2,94496	2,73972	2,58185	2,33703	2,14265	1,97515
1,35	4,44025	3,67636	3,30999	2,09492	2,78965	2,63175	2,38683	2,19233	2,02565
1,4	4,49025	3,72635	3,35998	3,0449	2,83961	2,68168	2,4367	2,2421	2,07529
1,45	4,54025	3,77635	3,40997	3,09488	2,88958	2,73163	2,48661	2,29195	2,12504
1,5	4,59025	3,82635	3,45997	3,14487	2,93956	2,7816	2,53655	2,34184	2,17486
1,55	4,64025	3,87635	3,50997	3,19486	2,98955	2,83159	2,58651	2,39177	2,22474
1,6	4,69025	3,92635	3,55996	3,24486	3,03954	2,88157	2,63648	2,44172	2,27466
1,65	4,74025	3,97635	3,60996	3,29486	3,08954	2,93157	2,68646	2,49168	2,3245
1,7	4,79025	4,02635	3,65996	3,34486	3,13954	2,98156	2,73645	2,54166	2,37456
1,75	4,84025	4,07635	3,70996	3,39485	3,18953	3,03156	2,78645	2,59165	2,42454
1,8	4,89025	4,12635	3,75996	3,44485	3,23953	3,08155	2,83644	2,64164	2,47452
1,85	4,94025	4,17635	3,80996	3,49485	3,28953	3,13155	2,88644	2,69163	2,52451
1,9	4,99025	4,22635	3,85996	3,54485	3,33953	3,18155	2,93644	2,74163	2,5745
1,95	5,04025	4,27635	3,90996	3,59485	3,38953	3,23155	2,98644	2,79162	2,6245
2,0	5,09025	4,32635	3,95996	3,64485	3,43953	3,28155	3,03643	2,84162	2,67449
2,5	5,59025	4,82635	4,45996	4,14485	3,93953	3,78155	3,53643	3,34162	3,17449
3,0	6,09025	5,32635	4,95996	4,64485	4,43953	4,28155	4,03643	3,84162	3,67449

Table B-1: Tabulated C* Values for α Error Level Control With σ Known

β / a	0,001	0,01	0,025	0,05	0,075	0,1	0,15	0,2	0,25
0,0	0,00125	0,01253	0,03134	0,06271	0,09414	0,12566	0,18912	0,25335	0,31864
0,1	0,00126	0,0126	0,0315	0,06302	0,09461	0,12629	0,19007	0,25462	0,32024
0,15	0,00127	0,01268	0,03169	0,06342	0,0952	0,12708	0,19126	0,25621	0,32224
0,2	0,00128	0,01279	0,03197	0,06397	0,09604	0,1282	0,19294	0,25846	0,32507
0,25	0,00129	0,01293	0,03233	0,0647	0,09713	0,12965	0,19512	0,26138	0,32874
0,3	0,00131	0,01311	0,03278	0,06559	0,09847	0,13144	0,19782	0,265	0,33328
0,35	0,00133	0,01333	0,03332	0,06667	0,10008	0,1336	0,20105	0,26933	0,33872
0,4	0,00136	0,01358	0,03395	0,06793	0,10198	0,13612	0,20485	0,27441	0,3451
0,45	0,00139	0,01387	0,03468	0,06939	0,10416	0,13904	0,20924	0,28027	0,35245
0,5	0,00142	0,0142	0,03551	0,07105	0,10667	0,14238	0,21425	0,28697	0,36084
0,55	0,00146	0,01458	0,03645	0,07294	0,1095	0,14616	0,21993	0,29454	0,37032
0,6	0,0015	0,01501	0,03752	0,07507	0,11269	0,15041	0,2263	0,30305	0,38095
0,65	0,00155	0,01548	0,03871	0,07745	0,11626	0,15517	0,23344	0,31255	0,39281
0,7	0,0016	0,01601	0,04004	0,08011	0,12024	0,16048	0,24138	0,32311	0,40597
0,75	0,00166	0,0166	0,04151	0,08306	0,12467	0,16637	0,2502	0,33481	0,42052
0,8	0,00173	0,01726	0,04315	0,08634	0,12958	0,17291	0,25995	0,34772	0,43654
0,85	0,0018	0,01799	0,04497	0,08997	0,13501	0,18014	0,27073	0,36197	0,45412
0,9	0,00188	0,01879	0,04698	0,09398	0,14102	0,18812	0,2826	0,3776	0,47336
0,95	0,00197	0,01968	0,0492	0,09842	0,14766	0,19693	0,29566	0,39473	0,49435
1,0	0,00207	0,02066	0,05166	0,10332	0,15498	0,20664	0,31	0,41347	0,51712
1,05	0,00218	0,02175	0,05437	0,10873	0,16306	0,21734	0,32574	0,43391	0,54192
1,1	0,0023	0,02295	0,05737	0,1147	0,17196	0,22911	0,34297	0,45615	0,56866
1,15	0,00243	0,02428	0,06069	0,1213	0,18178	0,24205	0,36181	0,48029	0,59744
1,2	0,00257	0,02575	0,06435	0,12859	0,1926	0,25628	0,38237	0,5064	0,62827
1,25	0,00274	0,02737	0,06841	0,13664	0,20452	0,27191	0,40476	0,53455	0,66118
1,3	0,00292	0,02917	0,0729	0,14553	0,21766	0,28906	0,42908	0,56479	0,69612
1,35	0,00312	0,03117	0,07787	0,15537	0,23213	0,30786	0,45542	0,59712	0,73392
1,4	0,00334	0,03339	0,08339	0,16624	0,24805	0,32843	0,48385	0,63152	0,7718
1,45	0,00359	0,03585	0,08952	0,17827	0,26557	0,35089	0,51441	0,66794	0,81221
1,5	0,00386	0,03859	0,09633	0,19157	0,28481	0,37536	0,54711	0,70629	0,85442
1,55	0,00417	0,04165	0,1039	0,20628	0,30591	0,40194	0,58194	0,74644	0,89725
1,6	0,00451	0,04505	0,11233	0,22255	0,329	0,4307	0,61881	0,78824	0,94273
1,65	0,00489	0,04886	0,12171	0,24051	0,35421	0,46169	0,65763	0,83152	0,98855
1,7	0,00532	0,05312	0,13218	0,26032	0,38162	0,49491	0,69827	0,87609	1,03529
1,75	0,0058	0,05789	0,14386	0,28213	0,41131	0,53033	0,74054	0,92178	1,08275
1,8	0,00630	0,06324	0,15689	0,30698	0,4433	0,56785	0,78427	0,9684	1,13092
1,85	0,00694	0,06925	0,17143	0,33229	0,47758	0,60725	0,82926	1,01579	1,17936
1,9	0,00762	0,07601	0,18764	0,36065	0,51409	0,64867	0,87532	1,06379	1,22827
1,95	0,00839	0,08363	0,2057	0,39182	0,5527	0,69181	0,92227	1,1123	1,27747
2,0	0,00926	0,09222	0,22579	0,42519	0,59327	0,73597	0,96993	1,16118	1,32689
2,05	0,01025	0,10191	0,24808	0,46092	0,63559	0,78154	1,01817	1,21036	1,37647
2,1	0,01137	0,11286	0,27272	0,49889	0,67944	0,8281	1,06687	1,25977	1,42617
2,15	0,01264	0,12524	0,29985	0,53805	0,72461	0,87549	1,1159	1,30935	1,47596
2,2	0,01409	0,13922	0,32955	0,58089	0,77088	0,92352	1,16521	1,35904	1,52582
2,25	0,01575	0,15501	0,36185	0,62446	0,81804	0,97207	1,2147	1,40883	1,57572
2,3	0,01765	0,17282	0,39671	0,66844	0,86591	1,021	1,26435	1,45862	1,62565
2,35	0,01982	0,19286	0,43403	0,71559	0,91433	1,07023	1,3141	1,50858	1,6756
2,4	0,02232	0,21534	0,47363	0,76268	0,96318	1,11968	1,36393	1,55851	1,72557
2,45	0,02519	0,24044	0,51528	0,81051	1,01236	1,16929	1,41381	1,60847	1,77555
2,5	0,02851	0,2683	0,55871	0,85933	1,06177	1,21902	1,46372	1,65844	1,82553
2,55	0,03233	0,299	0,60365	0,90778	1,11135	1,26883	1,51367	1,70842	1,87553
2,6	0,03676	0,33254	0,64982	0,95696	1,16107	1,3187	1,56363	1,7584	1,92552
2,65	0,0419	0,36882	0,69698	1,00639	1,21087	1,36861	1,61361	1,80839	1,97552
2,7	0,04787	0,40766	0,7449	1,05596	1,26073	1,41856	1,66359	1,85839	2,02551
2,75	0,0548	0,4488	0,79341	1,10571	1,31064	1,46852	1,71358	1,90839	2,07551
2,8	0,06288	0,49193	0,84234	1,15552	1,36058	1,51849	1,76358	1,95838	2,12551
2,85	0,0723	0,53672	0,8916	1,20539	1,41054	1,56848	1,81357	2,00838	2,17551
2,9	0,08328	0,58288	0,94108	1,2553	1,46051	1,61847	1,86357	2,05838	2,22551
2,95	0,09609	0,63005	0,99073	1,30525	1,5105	1,66846	1,91357	2,10838	2,27551
3,0	0,11099	0,67804	1,04049	1,35521	1,56049	1,71845	1,96357	2,15838	2,32551
3,1	0,14835	0,77564	1,14023	1,45517	1,66048	1,81845	2,06357	2,25838	2,42551
3,2	0,1977	0,87452	1,24011	1,55516	1,76047	1,91845	2,16357	2,35838	2,52551
3,3	0,26054	0,97401	1,34007	1,65515	1,86047	2,01845	2,26357	2,45839	2,62551
3,4	0,33636	1,0738	1,44005	1,75515	1,96047	2,11845	2,36357	2,55838	2,72551
3,5	0,42251	1,17371	1,54004	1,85515	2,06047	2,21845	2,46357	2,65838	2,82551
4,0	0,90986	1,67365	2,04004	2,35515	2,56047	2,71845	2,96357	3,15838	3,32551
4,5	1,40975	2,17365	2,54004	2,85515	3,06047	3,21845	3,46357	3,65838	3,82551
5,0	1,90975	2,67365	3,04004	3,35515	3,56047	3,71845	3,95357	4,15838	4,32551

Table B-2: Tabulated C* Values for β Error Level Control With σ Known

DF \ r	0.0	0.001	0.01	0.05	0.1	0.15	0.2	0.25	0.3
1	63.7031	63.7031	63.7031	63.8438	64.3125	65.1094	66.2344	67.6406	69.375
2	9.9258	9.9258	9.9316	9.9668	10.0752	10.2598	10.5059	10.8223	11.1914
3	5.8418	5.8418	5.8433	5.8711	5.9575	6.0967	6.2842	6.5156	6.7822
4	4.6055	4.6055	4.6055	4.6333	4.7175	4.8516	5.0288	5.2412	5.4814
5	4.0327	4.0327	4.0342	4.0627	4.1499	4.2876	4.4663	4.6758	4.9087
6	3.7083	3.7083	3.709	3.7397	3.8328	3.9771	4.1602	4.3726	4.6033
7	3.5002	3.5002	3.5013	3.5347	3.6335	3.7852	3.9756	4.1917	4.4238
8	3.356	3.356	3.3574	3.3933	3.4988	3.6592	3.8562	4.0767	4.3118
9	3.2505	3.2505	3.252	3.29	3.4028	3.5713	3.7756	4.0012	4.24
10	3.1699	3.1699	3.1714	3.2124	3.3325	3.509	3.72	3.9514	4.1931
11	3.1062	3.1062	3.108	3.1516	3.2787	3.4629	3.6819	3.9177	4.1638
12	3.0549	3.0549	3.0571	3.1033	3.2373	3.4299	3.6548	3.8965	4.1466
13	3.0125	3.0125	3.0146	3.0641	3.2051	3.405	3.6365	3.8833	4.1375
14	2.9773	2.9773	2.9795	3.0315	3.1794	3.3867	3.6248	3.8763	4.1349
15	2.9473	2.9473	2.9495	3.0044	3.1589	3.3735	3.6174	3.8738	4.1367
16	2.9209	2.9213	2.9238	2.9813	3.1425	3.364	3.6138	3.8752	4.1426
18	2.8788	2.8788	2.8813	2.9447	3.1194	3.3541	3.6149	3.8855	4.1616
20	2.8455	2.8458	2.8488	2.9176	3.1047	3.3523	3.6233	3.9034	4.188
22	2.8191	2.8191	2.8224	2.8967	3.0959	3.356	3.6368	3.9258	4.218
24	2.7971	2.7971	2.8008	2.8806	3.0923	3.3629	3.6533	3.9507	4.2517
26	2.7792	2.7792	2.7828	2.8682	3.0912	3.3728	3.6724	3.9778	4.2869
28	2.7634	2.7638	2.7675	2.8583	3.0927	3.3845	3.6929	4.0063	4.3235
30	2.7502	2.7502	2.7546	2.851	3.0959	3.3977	3.7141	4.036	4.3608
35	2.7242	2.7242	2.729	2.8385	3.1099	3.4343	3.7705	4.1111	4.455
40	2.7048	2.7048	2.7103	2.833	3.1285	3.4735	3.8287	4.1876	4.5491
45	2.6898	2.6902	2.696	2.8315	3.1498	3.5142	3.887	4.2627	4.6421
50	2.6781	2.6785	2.6851	2.833	3.1729	3.5548	3.9445	4.337	4.7325
60	2.6609	2.6609	2.6689	2.8414	3.2201	3.6357	4.0565	4.4802	4.9072
70	2.6484	2.6484	2.658	2.8539	3.2681	3.7137	4.1638	4.6168	5.0728
80	2.6393	2.6393	2.6499	2.8685	3.3157	3.7892	4.2664	4.7468	5.2302
90	2.632	2.6323	2.644	2.885	3.3618	3.8613	4.3649	4.8713	5.3804
100	2.6265	2.6268	2.6396	2.9019	3.4065	3.9313	4.4594	4.99	5.5239
125	2.6162	2.6166	2.6327	2.9451	3.5127	4.0946	4.6798	5.2679	5.8586
150	2.6096	2.61	2.6294	2.9883	3.6116	4.2458	4.8827	5.5228	6.1655

Table B-3: σ^2 Unknown C Values for α, P_T, $1-\beta = .01$ $[0 \le r \le .3]$

DF \ r	0.35	0.4	0.45	0.5	0.6	0.7	0.8	0.9	1.0
1	71.3438	73.5938	76.1719	78.9844	85.3125	92.625	100.5938	109.3125	118.5938
2	11.6133	12.082	12.5977	13.1484	14.3379	15.6328	17.0039	18.4336	19.9102
3	7.0781	7.4004	7.7402	8.1006	8.8594	9.6592	10.4883	11.3438	12.2197
4	5.7437	6.0234	6.3149	6.6167	7.2451	7.897	8.5693	9.2549	9.958
5	5.1577	5.4192	5.6895	5.9678	6.5405	7.1309	7.7358	8.354	8.9824
6	4.8479	5.1021	5.3628	5.6287	6.1743	6.7354	7.3096	7.894	8.4888
7	4.667	4.9175	5.1738	5.4346	5.9685	6.5149	7.0737	7.6421	8.2207
8	4.5557	4.8062	5.061	5.3203	5.8484	6.3896	6.9412	7.5029	8.0742
9	4.4861	4.7373	4.9929	5.2515	5.7803	6.3193	6.8701	7.4297	7.998
10	4.4421	4.6956	4.9526	5.2134	5.7437	6.2856	6.8379	7.3989	7.9688
11	4.4158	4.6721	4.9314	5.1943	5.729	6.2754	6.8306	7.396	7.9688
12	4.4019	4.6611	4.9241	5.1899	5.7297	6.2813	6.8423	7.4114	7.9893
13	4.3967	4.6597	4.9255	5.1943	5.7407	6.2981	6.865	7.4407	8.0244
14	4.3982	4.6644	4.9343	5.2068	5.7605	6.3241	6.8979	7.4795	8.0698
15	4.4041	4.6743	4.9475	5.224	5.7847	6.356	6.9368	7.5256	8.1226
16	4.4136	4.6882	4.9651	5.2456	5.814	6.3926	6.9807	7.5776	8.1812
18	4.4407	4.7234	5.009	5.2969	5.8813	6.4753	7.0789	7.6904	8.3101
20	4.4751	4.7659	5.0596	5.3558	5.9561	6.5665	7.1858	7.8131	8.4478
22	4.5139	4.8127	5.1145	5.4192	6.0359	6.6621	7.2971	7.9402	8.5913
24	4.5557	4.8625	5.1724	5.4851	6.1179	6.7595	7.4106	8.0698	8.7363
26	4.5992	4.9138	5.2317	5.5525	6.2007	6.8591	7.5256	8.2002	8.8828
28	4.6436	4.9666	5.2921	5.6206	6.2842	6.958	7.6406	8.3309	9.0278
30	4.6882	5.0193	5.3525	5.6887	6.3684	7.0576	7.7549	8.4602	9.1729
35	4.8018	5.1511	5.5034	5.8579	6.575	7.3011	8.0361	8.7788	9.5288
40	4.9138	5.2815	5.6514	6.0242	6.7771	7.5388	8.3097	9.0879	9.873
45	5.0237	5.4084	5.7957	6.1853	6.9727	7.7688	8.5737	9.3864	10.2056
50	5.131	5.532	5.9355	6.342	7.1624	7.9915	8.8293	9.6738	10.5267
60	5.3364	5.7686	6.2036	6.6412	7.5234	8.4155	9.3151	10.2224	11.1368
70	5.5313	5.9927	6.4567	6.9232	7.8636	8.8136	9.7705	10.7366	11.7089
80	5.7162	6.2047	6.6962	7.1902	8.1848	9.1893	10.2019	11.2222	12.2483
90	5.8923	6.4065	6.9243	7.4436	8.4902	9.5464	10.6102	11.6819	12.7595
100	6.0604	6.5999	7.1415	7.6857	8.7817	9.8866	11.0002	12.1205	13.248
125	6.4519	7.0481	7.647	8.2485	9.4585	10.6768	11.9048	13.1396	14.3804
150	6.8108	7.459	8.1097	8.7627	10.0767	11.3978	12.731	14.0685	15.4138

Table B-4: σ^2 Unknown C Values for α, P_T, $1-\beta$ = .01 [$.35 \leq r \leq 1$]

DF \ r	1.25	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0
2	23.7555	27.7453	35.9422	44.3265	52.7812	69.8375	86.9875	104.1375	121.3812
3	14.4742	16.8	21.5984	26.4906	31.4531	41.4898	51.6086	61.7507	71.9164
4	11.7584	13.6154	17.4412	21.3607	25.333	33.3658	41.4689	49.5955	57.7572
5	10.5982	12.2619	15.6863	19.1928	22.749	29.9498	37.2092	44.492	51.8099
6	10.0152	11.5852	14.8147	18.122	21.4731	28.2637	35.1071	41.9798	48.8758
7	9.7032	11.2248	14.3562	17.558	20.8066	27.3804	34.0129	40.6687	47.348
8	9.5348	11.0344	14.116	17.268	20.4639	26.9322	33.4533	40.0037	46.5716
9	9.4527	10.945	14.0076	17.1391	20.3144	26.7359	33.2101	39.7136	46.2347
10	9.4249	10.9172	13.9798	17.1098	20.2822	26.6978	33.1662	39.6638	46.1791
11	9.4322	10.9318	14.0061	17.1464	20.3291	26.7623	33.2511	39.7664	46.2992
12	9.4645	10.9743	14.0691	17.2284	20.4287	26.9	33.4211	39.9744	46.5423
13	9.5128	11.0373	14.157	17.3412	20.5664	27.0845	33.6554	40.2527	46.8675
14	9.5743	11.1135	14.2625	17.476	20.729	27.3057	33.9323	40.5882	47.2557
15	9.6446	11.1992	14.3819	17.6261	20.9128	27.5511	34.2392	40.9536	47.6915
16	9.7208	11.2937	14.5101	17.7894	21.1084	27.814	34.5695	41.3513	48.1537
18	9.8863	11.4973	14.7869	18.1381	21.5273	28.3765	35.2726	42.2009	49.138
20	10.0636	11.7111	15.077	18.5043	21.9697	28.9669	36.0124	43.0872	50.1766
22	10.2452	11.9323	15.3743	18.8793	22.4194	29.5689	36.7668	43.9939	51.2357
24	10.4298	12.1557	15.6753	19.2558	22.8735	30.1768	37.5278	44.9072	52.3014
26	10.6144	12.3791	15.9764	19.6337	23.3284	30.784	38.2865	45.8169	53.3641
28	10.7989	12.6018	16.2752	20.0079	23.7781	31.3861	39.038	46.7193	54.421
30	10.982	12.8229	16.5711	20.3793	24.2256	31.9801	39.7843	47.615	55.4618
35	11.4299	13.3627	17.294	21.2868	25.3147	33.4368	41.6059	49.8027	58.0113
40	11.8631	13.8842	17.9927	22.1613	26.3657	34.8394	43.3615	51.907	60.4701
45	12.2813	14.3874	18.6655	23.0032	27.3768	36.1897	45.0501	53.9384	62.834
50	12.684	14.8716	19.3134	23.8148	28.351	37.4883	46.6732	55.8867	65.1115
60	13.4497	15.7916	20.5432	25.3519	30.1972	39.9534	49.7542	59.5829	69.4263

Table B-5: σ^2 Unknown C Values for α, P_T, $1-\beta$ = .01 $[1.25 \leq r \leq 7]$

DF \ r	0.0	0.001	0.01	0.05	0.1	0.15	0.2	0.25	0.3
1	25.4531	25.4531	25.4648	25.5234	25.7109	26.0273	26.4727	27.0352	27.7148
2	6.2065	6.2065	6.2065	6.23	6.2988	6.4131	6.5684	6.7646	6.9976
3	4.177	4.177	4.1777	4.1975	4.2598	4.3597	4.4956	4.6619	4.8552
4	3.4958	3.4958	3.4966	3.5175	3.5815	3.6844	3.8214	3.9866	4.1748
5	3.1637	3.1637	3.1644	3.1871	3.2563	3.3658	3.5098	3.6801	3.8705
6	2.9689	2.9689	2.97	2.9947	3.0696	3.1875	3.3398	3.5175	3.7126
7	2.8414	2.8414	2.8425	2.8696	2.9509	3.0776	3.2388	3.4241	3.6251
8	2.7517	2.7517	2.7528	2.7823	2.8704	3.0059	3.1761	3.369	3.576
9	2.6851	2.6851	2.6865	2.7184	2.8132	2.9575	3.1362	3.3367	3.5497
10	2.6338	2.634	2.6353	2.6697	2.7711	2.9242	3.1117	3.3192	3.538
11	2.5931	2.5931	2.5948	2.6316	2.7398	2.9015	3.0969	3.3113	3.5359
12	2.5602	2.5602	2.5618	2.6012	2.7162	2.8859	3.0894	3.3102	3.5405
13	2.5327	2.5327	2.5345	2.5763	2.6981	2.8759	3.0866	3.314	3.5497
14	2.5096	2.5098	2.5117	2.5558	2.6841	2.87	3.0879	3.3214	3.5623
15	2.4901	2.4901	2.4921	2.5388	2.6735	2.8671	3.0919	3.3311	3.5773
16	2.473	2.473	2.4752	2.5245	2.6656	2.8665	3.098	3.343	3.5942
18	2.4452	2.4452	2.4474	2.5018	2.6558	2.8709	3.1148	3.3706	3.6317
20	2.4232	2.4232	2.4258	2.4851	2.6514	2.8801	3.1357	3.4017	3.6722
22	2.4056	2.4056	2.4084	2.4727	2.651	2.8923	3.1591	3.4347	3.7145
24	2.391	2.3912	2.3941	2.4633	2.6536	2.907	3.184	3.4689	3.7575
26	2.3789	2.379	2.3822	2.4564	2.658	2.9229	3.2098	3.5037	3.8009
28	2.3687	2.3687	2.3719	2.451	2.664	2.9399	3.2362	3.5387	3.8445
30	2.3597	2.3597	2.3633	2.4474	2.671	2.9575	3.2628	3.5737	3.8877
35	2.3421	2.3421	2.3463	2.4424	2.6922	3.0029	3.3294	3.6603	3.9939
40	2.3291	2.3291	2.3339	2.4419	2.7162	3.0491	3.3951	3.7447	4.097
45	2.319	2.319	2.3243	2.4441	2.7416	3.095	3.4592	3.8267	4.1966
50	2.3112	2.3112	2.317	2.4483	2.7678	3.1401	3.5215	3.906	4.2929
60	2.2993	2.2993	2.3062	2.4602	2.8204	3.2272	3.6409	4.0573	4.476
70	2.2908	2.291	2.2989	2.475	2.872	3.3102	3.7535	4.1995	4.6478
80	2.2846	2.2848	2.2938	2.4913	2.9222	3.3891	3.8602	4.3339	4.8098
90	2.2798	2.2798	2.2901	2.5084	2.9705	3.4644	3.9617	4.4615	4.9636
100	2.276	2.276	2.2874	2.5259	3.0172	3.5363	4.0585	4.5833	5.1105
125	2.269	2.2692	2.2831	2.5701	3.1269	3.704	4.2838	4.8662	5.4507
150	2.2645	2.2646	2.2815	2.6138	3.2281	3.8577	4.4897	5.1244	5.7612

Table B-6: σ^2 Unknown C Values for α, P_T, $1-\beta$ = .025 [$0 \leq r \leq .3$]

DF \ r	0.35	0.4	0.45	0.5	0.6	0.7	0.8	0.9	1.0
1	28.5117	29.4258	30.4453	31.5703	34.1133	37.0078	40.2188	43.6875	47.3906
2	7.2642	7.5601	7.8823	8.2295	8.981	9.7969	10.6641	11.5664	12.501
3	5.072	5.3071	5.5576	5.8206	6.3779	6.9653	7.5747	8.2031	8.8447
4	4.3806	4.6003	4.8311	5.0698	5.5671	6.0835	6.6152	7.1587	7.7124
5	4.0759	4.2916	4.5157	4.7457	5.22	5.7085	6.2087	6.7192	7.2385
6	3.9207	4.1367	4.3594	4.5868	5.0526	5.5305	6.019	6.5164	7.0217
7	3.8368	4.0554	4.2792	4.5066	4.9717	5.4474	5.9326	6.4263	6.9276
8	3.7921	4.014	4.2404	4.47	4.9376	5.4159	5.9026	6.3977	6.9005
9	3.7705	3.9965	4.2259	4.4586	4.9318	5.4148	5.9063	6.4058	6.9122
10	3.7637	3.9937	4.2272	4.4634	4.9435	5.4327	5.9308	6.4362	6.9489
11	3.7665	4.0009	4.2385	4.4788	4.9666	5.4635	5.9687	6.4814	7.0009
12	3.776	4.015	4.2568	4.5015	4.9977	5.5027	6.0157	6.5365	7.0638
13	3.7899	4.0336	4.2801	4.5289	5.0339	5.5474	6.0692	6.598	7.1338
14	3.8075	4.0558	4.3066	4.5601	5.0739	5.5964	6.1267	6.6643	7.2085
15	3.8273	4.0803	4.3359	4.5938	5.1167	5.6481	6.1873	6.7335	7.2865
16	3.8489	4.1067	4.3667	4.6293	5.1614	5.7015	6.2498	6.8049	7.3667
18	3.8958	4.1627	4.4323	4.704	5.254	5.8125	6.3785	6.9514	7.5308
20	3.9456	4.2217	4.5	4.7809	5.3489	5.9253	6.5092	7.1001	7.697
22	3.9968	4.2817	4.5692	4.8589	5.4446	6.0385	6.64	7.2484	7.8625
24	4.0488	4.3425	4.6386	4.9369	5.54	6.1512	6.77	7.3953	8.027
26	4.1008	4.4031	4.7076	5.0145	5.6347	6.2628	6.8983	7.5405	8.1888
28	4.1526	04.4632	4.7761	5.0912	5.7281	6.3728	7.0248	7.6835	8.3481
30	4.2039	4.5227	4.8439	5.1671	5.8201	6.4809	7.1492	7.8241	8.5049
35	4.3299	4.6683	5.009	5.3518	6.0439	6.7438	7.4507	8.1647	8.8843
40	4.4517	4.8087	5.1678	5.5292	6.2584	6.9954	7.7395	8.4901	9.2468
45	4.569	4.9437	5.3207	5.6997	6.464	7.2363	8.0156	8.8015	9.5936
50	4.6822	5.0739	5.4676	5.8636	6.6617	7.4679	8.2809	9.1003	9.9258
60	4.897	5.3205	5.746	6.1738	7.0356	7.905	8.7817	9.6645	10.5535
70	5.0984	5.5514	6.0064	6.4638	7.3846	8.313	9.2485	10.1906	11.1383
80	5.2883	5.7689	6.2518	6.7368	7.7129	8.6968	9.6877	10.685	11.6881
90	5.4684	5.9751	6.4841	6.9954	8.0237	9.0598	10.1032	11.1526	12.2077
100	5.6398	6.1716	6.7053	7.2414	8.3196	9.405	10.4983	11.597	12.702
125	6.0375	6.6268	7.218	7.8115	9.0044	10.2052	11.4128	12.627	13.8472
150	6.4003	7.0417	7.6853	8.3309	9.6282	10.9329	12.245	13.5638	14.8886

Table B-7: σ^2 Unknown C Values for α, P_T, $1-\beta = .025$ $[.35 \leq r \leq 1]$

DF \ r	1.25	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0
2	14.9283	17.4445	22.618	27.8969	33.2285	43.98	54.7785	65.6003	76.4456
3	10.4972	12.2004	15.7046	19.2872	22.9138	30.2406	37.6171	45.023	52.4405
4	9.1341	10.5971	13.6055	16.6813	19.7981	26.0994	32.4506	38.8223	45.2086
5	8.5694	9.9372	12.7479	15.6215	18.5332	24.42	30.3522	36.3108	42.2811
6	8.3153	9.6435	12.3699	15.1571	17.9795	23.6876	29.4411	35.2151	41.0067
7	8.2098	9.5241	12.2205	14.9755	17.7656	23.4049	29.0895	34.7962	40.5174
8	8.1842	9.4985	12.1941	14.9462	17.7319	23.3653	29.0397	34.739	40.4515
9	8.2054	9.5285	12.2396	15.0062	17.8059	23.4657	29.1664	34.8906	40.6295
10	8.256	9.5926	12.3293	15.1209	17.9454	23.6521	29.4026	35.1737	40.9595
11	8.3252	9.6787	12.4476	15.2707	18.126	23.8956	29.7077	35.5403	41.3876
12	8.4068	9.779	12.5845	15.4435	18.3347	24.1746	30.0571	35.96	41.879
13	8.4969	9.8896	12.7339	15.6317	18.5618	24.4779	30.4364	36.417	42.4108
14	8.5929	10.0057	12.8918	15.8298	18.8002	24.7968	30.836	36.8971	42.9714
15	8.6925	10.1269	13.0547	16.0346	19.0466	25.1268	31.2487	37.3919	43.5497
16	8.7947	10.2503	13.2214	16.2437	19.2989	25.4633	31.6695	37.8976	44.1374
18	9.0027	10.5026	13.5601	16.6688	19.8091	26.1456	32.5231	38.9219	45.3342
20	9.2129	10.7559	13.9005	17.0957	20.3223	26.8309	33.3799	39.95	46.5356
22	9.422	11.008	14.2383	17.5192	20.8315	27.5108	34.2297	40.9712	47.7267
24	9.6285	11.2578	14.5723	17.9378	21.3343	28.1814	35.0694	41.9801	48.9011
26	9.8325	11.5031	14.9012	18.3494	21.8287	28.842	35.8948	42.9696	50.0576
28	10.0328	11.7445	15.2238	18.7537	22.3143	29.4902	36.7056	43.9434	51.1925
30	10.2298	11.9814	15.5409	19.1499	22.7908	30.1256	37.5007	44.8972	52.306
35	10.7059	12.5542	16.3071	20.1094	23.9421	31.6622	39.4211	47.2032	54.9958
40	11.1607	13.101	17.0372	21.0227	25.0389	33.1259	41.2517	49.4002	57.559
45	11.5953	13.6237	17.7351	21.8961	26.0876	34.5239	42.9999	51.498	60.0061
50	12.0118	14.1237	18.4036	22.7322	27.0919	35.863	44.6736	53.5062	62.3517
60	12.7979	15.068	19.6634	24.3087	28.9827	38.3866	47.8285	57.2925	66.7685

Table B-8: σ^2 Unknown C Values for α, P_T, $1-\beta$ = .025 [$1.25 \leq r \leq 7$]

DF \ r	0.0	0.001	0.01	0.05	0.1	0.15	0.2	0.25	0.3
1	12.7075	12.709	12.709	12.7383	12.835	12.9932	13.2129	13.4941	13.834
2	4.303	4.303	4.3037	4.3191	4.3671	4.4462	4.5549	4.6919	4.8545
3	3.1826	3.1827	3.1831	3.1985	3.2455	3.3226	3.427	3.5561	3.7068
4	2.7766	2.7766	2.7773	2.7938	2.8449	2.9277	3.0386	3.1736	3.3283
5	2.5706	2.5706	2.5715	2.5898	2.6464	2.7371	2.857	3.0009	3.1633
6	2.447	2.447	2.4478	2.4683	2.5307	2.6299	2.7599	2.9136	3.0844
7	2.3647	2.3647	2.3656	2.3882	2.4567	2.5649	2.7048	2.8682	3.0473
8	2.306	2.3061	2.3071	2.3318	2.4066	2.5237	2.6735	2.8462	3.0333
9	2.2623	2.2623	2.2634	2.2903	2.3714	2.4974	2.6567	2.8381	3.033
10	2.2282	2.2282	2.2295	2.2586	2.346	2.4807	2.6493	2.8391	3.0411
11	2.2011	2.2011	2.2024	2.2337	2.3275	2.4707	2.6481	2.8458	3.0548
12	2.1789	2.1789	2.1803	2.2139	2.3139	2.4655	2.6514	2.8567	3.0723
13	2.1605	2.1605	2.1619	2.1978	2.304	2.4639	2.6579	2.8704	3.0922
14	2.1449	2.1449	2.1465	2.1845	2.2971	2.4648	2.6666	2.886	3.1139
15	2.1315	2.1315	2.1333	2.1736	2.2921	2.4677	2.677	2.903	3.1367
16	2.12	2.12	2.1218	2.1643	2.289	2.4722	2.6887	2.921	3.1603
18	2.101	2.101	2.103	2.15	2.2868	2.4846	2.7147	2.9589	3.2089
20	2.086	2.0861	2.0882	2.1398	2.2883	2.5	2.7429	2.9982	3.2584
22	2.0739	2.0739	2.0763	2.1323	2.2924	2.5174	2.7722	3.0379	3.3079
24	2.064	2.064	2.0665	2.127	2.2984	2.5361	2.802	3.0776	3.3571
26	2.0556	2.0556	2.0584	2.1232	2.3058	2.5556	2.832	3.1171	3.4056
28	2.0485	2.0485	2.0515	2.1207	2.3142	2.5755	2.8619	3.1561	3.4534
30	2.0424	2.0424	2.0456	2.1192	2.3232	2.5957	2.8917	3.1945	3.5003
35	2.0302	2.0303	2.0338	2.1184	2.3482	2.6463	2.9647	3.2882	3.6142
40	2.0212	2.0212	2.0253	2.1207	2.375	2.6965	3.0352	3.3779	3.7231
45	2.0142	2.0143	2.0188	2.1249	2.4024	2.7455	3.1031	3.4641	3.8273
50	2.0087	2.0088	2.0138	2.1304	2.4302	2.7932	3.1685	3.5468	3.9272
60	2.0004	2.0005	2.0065	2.1441	2.4851	2.8844	3.2924	3.7031	4.1158
70	1.9946	1.9947	2.0016	2.1595	2.5386	2.9702	3.4085	3.8491	4.2916
80	1.9902	1.9903	1.9982	2.1761	2.5901	3.0514	3.5177	3.9864	4.4569
90	1.9868	1.9869	1.9958	2.1932	2.6397	3.1284	3.6213	4.1162	4.6132
100	1.9841	1.9842	1.9941	2.2106	2.6874	3.2018	3.7198	4.2398	4.7617
125	1.9793	1.9795	1.9917	2.2543	2.7991	3.3723	3.9481	4.526	5.1058
150	1.9761	1.9763	1.991	2.2972	2.9018	3.5278	4.1561	4.7865	5.4187

Table B-9: σ^2 Unknown C Values for α, P_T, $1-\beta = .05$ $[0 \leq r \leq .30]$

DF \ r	0.35	0.4	0.45	0.5	0.6	0.7	0.8	0.9	1.0
1	14.2354	14.6895	15.1992	15.7617	17.0303	18.4775	20.0801	21.8203	23.6719
2	5.0413	5.2485	5.4756	5.7188	6.249	6.8247	7.4355	8.0728	8.7319
3	3.876	4.0602	4.2576	4.4652	4.905	5.3694	5.8513	6.3472	6.854
4	3.4988	3.6815	3.8738	4.0735	4.4894	4.9215	5.3657	5.8198	6.2816
5	3.3395	3.5257	3.7192	3.9185	4.329	4.7516	5.1841	5.6246	6.0721
6	3.2672	3.4583	3.6553	3.8568	4.2693	4.6923	5.1235	5.5622	6.0073
7	3.2369	3.4336	3.635	3.8401	4.2585	4.686	5.1213	5.5635	6.0121
8	3.2296	3.4319	3.6382	3.8476	4.2737	4.7084	5.1504	5.5992	6.0538
9	3.2358	3.4437	3.6551	3.8692	4.3043	4.7474	5.1976	5.6545	6.117
10	3.2503	3.4638	3.6803	3.8994	4.344	4.7964	5.2559	5.7215	6.193
11	3.2701	3.4891	3.7108	3.9351	4.3896	4.8517	5.3207	5.796	6.2769
12	3.2933	3.5178	3.7449	3.9742	4.4388	4.9109	5.3899	5.8748	6.3653
13	3.319	3.5488	3.7811	4.0156	4.4905	4.9726	5.4613	5.9562	6.4567
14	3.3462	3.5814	3.8188	4.0583	4.5434	5.0356	5.5345	6.0394	6.5495
15	3.3744	3.6148	3.8574	4.1021	4.5972	5.0995	5.6083	6.123	6.6432
16	3.4033	3.6488	3.8965	4.1462	4.6514	5.1637	5.6823	6.2069	6.7369
18	3.4622	3.7178	3.9754	4.235	4.76	5.2918	5.8301	6.3741	6.9236
20	3.5215	3.7868	4.0541	4.3235	4.8676	5.4186	5.976	6.5391	7.1074
22	3.5805	3.8553	4.132	4.4106	4.9735	5.5432	6.1192	6.7007	7.2878
24	3.6389	3.9228	4.2087	4.4965	5.0775	5.6654	6.2595	6.8591	7.464
26	3.6964	3.9891	4.2839	4.5806	5.1793	5.7849	6.3965	7.0139	7.6364
28	3.7527	4.0542	4.3577	4.663	5.279	5.9017	6.5305	7.1651	7.8047
30	3.8082	4.1182	4.4301	4.7437	5.3765	6.0159	6.6616	7.3128	7.9691
35	3.9423	4.2724	4.6044	4.9382	5.6111	6.2908	6.9765	7.6678	8.3641
40	4.0703	4.4193	4.7703	5.1231	5.8341	6.5517	7.2752	8.0044	8.7385
45	4.1925	4.5595	4.9286	5.2994	6.0463	6.7998	7.5595	8.3246	9.0945
50	4.3096	4.6939	5.0801	5.4681	6.2494	7.0373	7.8311	8.6305	9.4347
60	4.5304	4.947	5.3654	5.7856	6.6313	7.4835	8.3418	9.2054	10.0741
70	4.7362	5.1826	5.631	6.081	6.9865	7.8983	8.8162	9.7396	10.6677
80	4.9294	5.4038	5.8801	6.3582	7.3195	8.2873	9.2611	10.2404	11.2244
90	5.112	5.6128	6.1155	6.62	7.634	8.6545	9.6811	10.7128	11.7495
100	5.2857	5.8115	6.3392	6.8687	7.9328	9.0033	10.0799	11.1617	12.2487
125	5.6874	6.2711	6.8566	7.4439	8.6236	9.8096	11.0016	12.1989	13.4014
150	6.053	6.6891	7.3271	7.9667	9.2514	10.5421	11.8391	13.1418	14.449

Table B-10: σ^2 Unknown C Values for α, P_T, $1-\beta$ = .05 [$.35 \le r \le 1$]

DF \ r	1.25	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0
2	10.4437	12.2158	15.8599	19.5744	23.324	30.8763	38.4697	46.0806	53.7003
3	8.1571	9.4985	12.2535	15.067	17.9128	23.6575	29.4404	35.2407	41.0528
4	7.4657	8.6818	11.1783	13.7274	16.3074	21.5181	26.7648	32.0305	37.3065
5	7.2174	8.3916	10.7994	13.2574	15.745	20.7691	25.829	30.9072	35.9971
6	7.1449	8.3098	10.6963	13.1305	15.594	20.5689	25.5798	30.6082	35.6483
7	7.1566	8.3273	10.7242	13.1675	15.639	20.6301	25.6556	30.7001	35.7549
8	7.2132	8.3982	10.8216	13.2909	15.7877	20.8293	25.9053	30.9996	36.1042
9	7.2956	8.4991	10.9585	13.4634	15.9957	21.1069	26.2525	31.4164	36.5913
10	7.3932	8.6181	11.1193	13.665	16.238	21.4304	26.6573	31.9025	37.158
11	7.5005	8.7478	11.2938	13.884	16.5013	21.782	27.0968	32.4299	37.7732
12	7.6125	8.8836	11.4764	14.1131	16.7765	22.1499	27.5569	32.9816	38.418
13	7.7282	9.0235	11.6642	14.3482	17.0592	22.5267	28.0282	33.5474	39.0782
14	7.8456	9.1652	11.8543	14.5862	17.3448	22.9083	28.5051	34.1201	39.7462
15	7.9637	9.3077	12.0451	14.8253	17.6321	23.2915	28.9842	34.6953	40.4165
16	8.082	9.4501	12.2359	15.0645	17.9191	23.674	29.4627	35.2697	41.0876
18	8.3167	9.733	12.6144	15.5382	18.4883	24.4337	30.4121	36.4088	42.4164
20	8.548	10.0114	12.9864	16.004	19.0472	25.1793	31.3448	37.5283	43.722
22	8.7743	10.2836	13.3506	16.4594	19.5945	25.909	32.2574	38.6232	45.0001
24	8.9957	10.5501	13.7062	16.9043	20.1288	26.622	33.1482	39.692	46.2475
26	9.2118	10.8099	14.0534	17.339	20.6503	27.3175	34.018	40.7361	47.4652
28	9.4229	11.0637	14.3923	17.7627	21.1589	27.9962	34.8663	41.7543	48.6534
30	9.6289	11.3112	14.723	18.1763	21.6553	28.6583	35.6943	42.7486	49.8124
35	10.124	11.906	15.5169	19.1694	22.8476	30.2484	37.682	45.1333	52.5959
40	10.5927	12.4692	16.2686	20.1094	23.9762	31.7534	39.5635	47.392	55.2296
45	11.0386	13.0048	16.9834	21.0032	25.0491	33.1837	41.3516	49.5382	57.7343
50	11.4643	13.516	17.6655	21.8564	26.0729	34.549	43.0579	51.5858	60.1235
60	12.2643	14.4762	18.9469	23.459	27.996	37.1139	46.2647	55.4328	64.6111

Table B-11: σ^2 Unknown C Values for α, P_T, $1-\beta = .05$ $[1.25 \leq r \leq 7]$

DF \ r	0.0	0.001	0.01	0.05	0.1	0.15	0.2	0.25	0.3
1	6.3142	6.3142	6.3149	6.33	6.3772	6.4556	6.5654	6.7053	6.8745
2	2.9202	2.9202	2.9205	2.931	2.9637	3.0176	3.0921	3.186	3.2983
3	2.3535	2.3535	2.3539	2.3652	2.4001	2.4576	2.5362	2.6342	2.7496
4	2.1319	2.1319	2.1324	2.1452	2.1847	2.2492	2.3367	2.4446	2.5699
5	2.0151	2.0151	2.0157	2.0302	2.0749	2.1474	2.2451	2.3641	2.5004
6	1.9432	1.9432	1.9439	1.9601	2.0103	2.0912	2.1993	2.3296	2.4768
7	1.8946	1.8946	1.8954	1.9135	1.9691	2.0587	2.1771	2.3182	2.4758
8	1.8596	1.8596	1.8604	1.8804	1.9417	2.0397	2.1683	2.3199	2.4872
9	1.8332	1.8332	1.8341	1.856	1.9229	2.0294	2.1678	2.3294	2.5058
10	1.8125	1.8125	1.8135	1.8373	1.9099	2.0247	2.1728	2.3437	2.5287
11	1.7959	1.7959	1.797	1.8227	1.9009	2.024	2.1813	2.3612	2.5542
12	1.7823	1.7823	1.7835	1.8111	1.895	2.0262	2.1924	2.3808	2.5813
13	1.771	1.771	1.7722	1.8018	1.8912	2.0304	2.2053	2.4017	2.6094
14	1.7613	1.7614	1.7627	1.7941	1.8891	2.0362	2.2194	2.4235	2.638
15	1.7531	1.7531	1.7545	1.7878	1.8885	2.0432	2.2344	2.4458	2.6669
16	1.7459	1.746	1.7474	1.7827	1.8888	2.0511	2.2501	2.4685	2.6958
18	1.7341	1.7341	1.7357	1.7749	1.8919	2.0689	2.2827	2.5142	2.7532
20	1.7248	1.7248	1.7265	1.7695	1.8974	2.0885	2.316	2.5597	2.8097
22	1.7172	1.7172	1.7192	1.766	1.9045	2.1092	2.3496	2.6046	2.865
24	1.7109	1.7109	1.713	1.7637	1.9128	2.1305	2.383	2.6487	2.919
26	1.7057	1.7057	1.708	1.7624	1.9219	2.1521	2.4161	2.6918	2.9716
28	1.7012	1.7012	1.7037	1.7619	1.9317	2.174	2.4488	2.7341	3.023
30	1.6973	1.6973	1.7	1.762	1.9418	2.1958	2.4809	2.7754	3.0731
35	1.6896	1.6897	1.6927	1.7642	1.9687	2.2498	2.5586	2.8747	3.1932
40	1.6839	1.6839	1.6874	1.7683	1.9964	2.3026	2.6329	2.9689	3.3069
45	1.6795	1.6795	1.6833	1.7737	2.0246	2.3537	2.7038	3.0584	3.4148
50	1.676	1.676	1.6802	1.7798	2.0528	2.4032	2.7718	3.1439	3.5178
60	1.6707	1.6707	1.6758	1.7938	2.1084	2.4972	2.8996	3.3045	3.711
70	1.667	1.667	1.6729	1.8091	2.1623	2.5853	3.0184	3.4536	3.8904
80	1.6642	1.6642	1.6709	1.8251	2.2143	2.6683	3.1298	3.5933	4.0582
90	1.662	1.6621	1.6696	1.8414	2.2644	2.7468	3.235	3.725	4.2166
100	1.6603	1.6604	1.6687	1.8579	2.3125	2.8214	3.3349	3.8502	4.3669
125	1.6572	1.6573	1.6676	1.8993	2.4253	2.9941	3.5659	4.1392	4.7141
150	1.6552	1.6553	1.6677	1.9402	2.5289	3.1512	3.7757	4.4018	5.0294

Table B-12: σ^2 Unknown C Values for α, P_T, $1-\beta = .1$ $[0 \leq r \leq .3]$

DF \ r	0.35	0.4	0.45	0.5	0.6	0.7	0.8	0.9	1.0
1	7.0737	7.3	7.5542	7.834	8.4675	9.1904	9.991	10.8589	11.7839
2	3.4272	3.5715	3.7295	3.8998	4.2715	4.6761	5.1061	5.5551	6.0187
3	2.8801	3.0233	3.1772	3.34	3.6861	4.052	4.4321	4.8226	5.2213
4	2.7092	2.8598	3.0192	3.1853	3.5322	3.8928	4.2631	4.6409	5.0249
5	2.6498	2.8091	2.9756	3.1474	3.5019	3.8668	4.2394	4.6183	5.0026
6	2.6361	2.804	2.9778	3.1557	3.5204	3.8936	4.2735	4.6589	5.0495
7	2.6444	2.8205	3.0013	3.1856	3.5615	3.9447	4.3342	4.729	5.1286
8	2.6646	2.8481	3.0359	3.2265	3.614	4.0083	4.4084	4.8137	5.2235
9	2.6912	2.8821	3.0764	3.2732	3.6725	4.0782	4.4895	4.9059	5.3267
10	2.7217	2.9194	3.1201	3.3231	3.7342	4.1515	4.5742	5.0018	5.4339
11	2.7544	2.9586	3.1656	3.3745	3.7973	4.2262	4.6603	5.0994	5.5428
12	2.7883	2.9989	3.2119	3.4266	3.8611	4.3013	4.7469	5.1973	5.652
13	2.8229	3.0396	3.2584	3.4789	3.9248	4.3764	4.8333	5.2948	5.7607
14	2.8577	3.0802	3.3048	3.5311	3.9881	4.4509	4.9189	5.3914	5.8683
15	2.8925	3.1208	3.3509	3.5827	4.0508	4.5246	5.0034	5.4869	5.9747
16	2.9272	3.161	3.3967	3.6339	4.1129	4.5974	5.0869	5.5812	6.0797
18	2.9957	3.2402	3.4865	3.7343	4.2344	4.7399	5.2505	5.7655	6.2848
20	3.0626	3.3175	3.574	3.832	4.3523	4.8782	5.4089	5.9442	6.4836
22	3.1279	3.3927	3.659	3.9269	4.4668	5.0121	5.5625	6.1173	6.676
24	3.1915	3.4658	3.7417	4.019	4.5779	5.1422	5.7114	6.285	6.8627
26	3.2535	3.537	3.8221	4.1085	4.6859	5.2684	5.8559	6.4479	7.0438
28	3.3138	3.6063	3.9002	4.1956	4.7907	5.3911	5.9963	6.606	7.2197
30	3.3726	3.6737	3.9763	4.2804	4.8928	5.5105	6.1329	6.7598	7.3907
35	3.5134	3.8352	4.1585	4.4832	5.1367	5.7956	6.4592	7.1272	7.7992
40	3.6465	3.9877	4.3304	4.6744	5.3667	6.0643	6.7667	7.4733	8.1839
45	3.7728	4.1323	4.4933	4.8558	5.5847	6.3189	7.0578	7.8011	8.5482
50	3.8932	4.2702	4.6486	5.0285	5.7924	6.5613	7.3351	8.1131	8.8951
60	4.1191	4.5287	4.9398	5.3524	6.1814	7.0155	7.8545	8.6977	9.5448
70	4.3286	4.7684	5.2097	5.6524	6.5417	7.4362	8.3354	9.239	10.1462
80	4.5247	4.9927	5.4622	5.9331	6.8789	7.8297	8.7853	9.7452	10.7087
90	4.7097	5.2043	5.7003	6.1978	7.1967	8.2006	9.2093	10.2224	11.2391
100	4.8852	5.405	5.9262	6.4489	7.4981	8.5525	9.6114	10.6747	11.7418
125	5.2905	5.8684	6.4477	7.0285	8.194	9.3645	10.5396	11.7192	12.9025
150	5.6585	6.289	6.9211	7.5545	8.8254	10.1013	11.3817	12.6666	13.9556

Table B-13: σ^2 Unknown C Values for α, P_T, $1-\beta = .1$ $[.35 \le r \le 1]$

DF \ r	1.25	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0
2	7.2224	8.4672	11.0215	13.6201	16.2422	21.52	26.8213	32.1343	37.4531
3	6.2446	7.2953	9.4486	11.6418	13.8574	18.3252	22.8179	27.323	31.8354
4	6.0064	7.0118	9.0692	11.1643	13.2817	17.5525	21.8481	26.1577	30.4739
5	5.983	6.9853	9.0341	11.1196	13.2264	17.4763	21.7515	26.0398	30.3362
6	6.0445	7.0604	9.1348	11.2449	13.3762	17.6748	21.9983	26.3357	30.6804
7	6.1454	7.1826	9.2979	11.4487	13.6205	17.9993	22.4033	26.8213	31.2466
8	6.2657	7.3275	9.492	11.6911	13.9111	18.386	22.8867	27.4006	31.9226
9	6.3959	7.4844	9.7017	11.9531	14.2251	18.8046	23.4093	28.0276	32.6539
10	6.5308	7.6469	9.9186	12.2243	14.5507	19.2382	23.9509	28.6772	33.4116
11	6.6678	7.8116	10.1385	12.4991	14.8804	19.6776	24.5002	29.3361	34.1803
12	6.8049	7.9765	10.3588	12.7745	15.2106	20.1178	25.0503	29.9963	34.9501
13	6.9413	8.1406	10.5776	13.0483	15.5391	20.5554	25.5972	30.6526	35.7158
14	7.0765	8.3029	10.7944	13.3191	15.8641	20.9886	26.1387	31.3022	36.4739
15	7.2099	8.4633	11.0083	13.5867	16.1851	21.4167	26.6735	31.9438	37.2224
16	7.3414	8.6213	11.2192	13.8503	16.5015	21.8383	27.2007	32.5763	37.96
18	7.5985	8.9302	11.6314	14.3655	17.1196	22.6626	28.2305	33.8123	39.4021
20	7.8474	9.2292	12.0304	14.8643	17.7182	23.4606	29.228	35.009	40.7981
22	8.0886	9.5187	12.4167	15.3471	18.2977	24.2329	30.1937	36.1679	42.1501
24	8.3222	9.7993	12.791	15.8151	18.8591	24.9816	31.1294	37.2905	43.4601
26	8.5488	10.0715	13.1539	16.2689	19.4037	25.7076	32.0369	38.3796	44.7308
28	8.7689	10.3358	13.5065	16.7095	19.9326	26.4128	32.9183	39.4373	45.9644
30	8.983	10.5927	13.8492	17.1379	20.4467	27.0983	33.7751	40.4652	47.1643
35	9.494	11.2063	14.6677	18.161	21.6744	28.7353	35.8213	42.9214	50.0281
40	9.9753	11.784	15.4379	19.1243	22.8301	30.2761	37.7476	45.2322	52.7249
45	10.431	12.3311	16.1676	20.0361	23.9246	31.7353	39.5713	47.4214	55.2784
50	10.8647	12.8518	16.862	20.9041	24.9662	33.1241	41.3071	49.5045	57.709
60	11.6772	13.8269	18.1622	22.5298	26.9171	35.725	44.5591	53.4056	62.2617

Table B-14: σ^2 Unknown C Values for α, P_T, $1-\beta = .1$ $[1.25 \leq r \leq 7]$

DF \ r	0.0	0.001	0.01	0.05	0.1	0.15	0.2	0.25	0.3
1	3.0778	3.0778	3.0781	3.0855	3.1086	3.1469	3.2003	3.2688	3.3521
2	1.8857	1.8857	1.8859	1.8927	1.9139	1.949	1.9978	2.0598	2.1346
3	1.6378	1.6378	1.6381	1.6459	1.6704	1.711	1.7672	1.8383	1.9232
4	1.5332	1.5332	1.5336	1.5428	1.5715	1.6188	1.6842	1.7665	1.8639
5	1.4759	1.4759	1.4763	1.487	1.52	1.5746	1.6497	1.7436	1.8538
6	1.4398	1.4398	1.4403	1.4524	1.49	1.552	1.6369	1.7424	1.8648
7	1.4149	1.4149	1.4155	1.4291	1.4713	1.5407	1.6355	1.7523	1.8865
8	1.3968	1.3968	1.3975	1.4125	1.4594	1.5363	1.6408	1.7685	1.9138
9	1.383	1.3831	1.3837	1.4003	1.4518	1.5362	1.6503	1.7885	1.9443
10	1.3722	1.3722	1.373	1.3911	1.4472	1.539	1.6625	1.8109	1.9764
11	1.3634	1.3634	1.3643	1.3839	1.4447	1.5439	1.6766	1.8347	2.0095
12	1.3562	1.3563	1.3571	1.3782	1.4438	1.5504	1.692	1.8594	2.0429
13	1.3502	1.3502	1.3511	1.3738	1.444	1.5578	1.7082	1.8846	2.0763
14	1.345	1.3451	1.3461	1.3702	1.4451	1.5661	1.7252	1.91	2.1095
15	1.3406	1.3407	1.3417	1.3674	1.4469	1.5751	1.7425	1.9355	2.1423
16	1.3368	1.3368	1.3379	1.3651	1.4493	1.5846	1.7601	1.9609	2.1747
18	1.3304	1.3304	1.3317	1.3619	1.4554	1.6046	1.7958	2.0113	2.2382
20	1.3254	1.3254	1.3268	1.3601	1.4627	1.6256	1.8316	2.0607	2.2997
22	1.3213	1.3213	1.3228	1.3591	1.471	1.6472	1.8671	2.1089	2.3591
24	1.3179	1.3179	1.3195	1.3589	1.4799	1.6691	1.9023	2.1558	2.4166
26	1.315	1.315	1.3168	1.3593	1.4893	1.6911	1.9369	2.2015	2.4723
28	1.3125	1.3126	1.3145	1.36	1.4991	1.7132	1.9709	2.246	2.5263
30	1.3104	1.3105	1.3125	1.3611	1.5091	1.7352	2.0043	2.2892	2.5787
35	1.3062	1.3063	1.3086	1.3648	1.535	1.7895	2.0849	2.3926	2.7036
40	1.3031	1.3031	1.3058	1.3696	1.5615	1.8426	2.1615	2.49	2.8209
45	1.3007	1.3007	1.3037	1.3751	1.5883	1.8941	2.2344	2.5822	2.9318
50	1.2987	1.2988	1.3021	1.3811	1.615	1.944	2.304	2.6698	3.0371
60	1.2959	1.2959	1.2998	1.3939	1.6681	2.0391	2.4345	2.8337	3.2341
70	1.2938	1.2938	1.2984	1.4076	1.72	2.1282	2.5555	2.9852	3.416
80	1.2923	1.2923	1.2975	1.4217	1.7704	2.2122	2.6685	3.1268	3.586
90	1.2911	1.2911	1.297	1.436	1.8194	2.2916	2.7751	3.2601	3.7461
100	1.2901	1.2902	1.2966	1.4505	1.8667	2.367	2.8761	3.3864	3.8978
125	1.2884	1.2885	1.2965	1.487	1.9785	2.5414	3.109	3.6778	4.2475
150	1.2873	1.2874	1.297	1.5234	2.0819	2.6996	3.3203	3.9419	4.5646

Table B-15: σ^2 Unknown C Values for α, P_T, $1-\beta = .2$ $[0 \le r \le .3]$

DF \ r	0.35	0.4	0.45	0.5	0.6	0.7	0.8	0.9	1.0
1	3.4497	3.5614	3.6866	3.8251	4.1387	4.4974	4.8957	5.328	5.7887
2	2.2213	2.3191	2.4272	2.5443	2.8017	3.084	3.3847	3.6993	4.0239
3	2.0207	2.1292	2.2471	2.3728	2.6423	2.929	3.2272	3.5333	3.8452
4	1.9744	2.0958	2.2257	2.3623	2.6496	2.9491	3.2565	3.5694	3.8866
5	1.9772	2.1109	2.2523	2.3992	2.704	3.0179	3.3376	3.6617	3.9896
6	2.0005	2.1456	2.2975	2.4538	2.775	3.1033	3.4365	3.7736	4.1142
7	2.0334	2.1891	2.3503	2.5153	2.8521	3.1946	3.5416	3.8922	4.246
8	2.0712	2.2364	2.4064	2.5793	2.9309	3.2875	3.6481	4.0123	4.3796
9	2.1114	2.2853	2.4633	2.6438	3.0095	3.3798	3.754	4.1315	4.5122
10	2.1525	2.3346	2.5201	2.7077	3.0871	3.4708	3.8582	4.2489	4.6427
11	2.1939	2.3836	2.5762	2.7706	3.1631	3.5599	3.9602	4.3639	4.7704
12	2.2352	2.432	2.6313	2.8322	3.2376	3.647	4.06	4.4762	4.8953
13	2.2759	2.4796	2.6853	2.8926	3.3104	3.7321	4.1574	4.5859	5.0173
14	2.3161	2.5262	2.7383	2.9516	3.3815	3.8153	4.2526	4.693	5.1363
15	2.3556	2.5719	2.79	3.0093	3.451	3.8965	4.3455	4.7976	5.2526
16	2.3944	2.6167	2.8406	3.0657	3.5189	3.9759	4.4363	4.8998	5.3662
18	2.4698	2.7036	2.9387	3.1749	3.6503	4.1294	4.6119	5.0975	5.5859
20	2.5424	2.787	3.0328	3.2797	3.7763	4.2766	4.7802	5.2869	5.7964
22	2.6124	2.8673	3.1234	3.3804	3.8974	4.418	4.9419	5.4689	5.9986
24	2.68	2.9447	3.2106	3.4774	4.014	4.5542	5.0977	5.6442	6.1935
26	2.7453	3.0196	3.2949	3.5712	4.1267	4.6858	5.2481	5.8135	6.3815
28	2.8086	3.092	3.3765	3.662	4.2357	4.813	5.3936	5.9772	6.5635
30	2.8699	3.1622	3.4556	3.7499	4.3414	4.9364	5.5347	6.1359	6.7398
35	3.016	3.3294	3.6438	3.9592	4.5927	5.2298	5.8701	6.5133	7.1592
40	3.1531	3.4862	3.8203	4.1554	4.8284	5.5049	6.1845	6.8671	7.5524
45	3.2825	3.6343	3.987	4.3407	5.0509	5.7645	6.4813	7.2011	7.9234
50	3.4055	3.775	4.1454	4.5168	5.2622	6.0112	6.7632	7.5183	8.2759
60	3.6355	4.0379	4.4413	4.8457	5.657	6.4719	7.2898	8.1107	8.9342
70	3.8479	4.2808	4.7146	5.1494	6.0217	6.8974	7.7761	8.6579	9.5422
80	4.0463	4.5076	4.9698	5.4331	6.3621	7.2946	8.2302	9.1687	10.1097
90	4.2331	4.7211	5.2102	5.7001	6.6826	7.6685	8.6576	9.6496	10.644
100	4.4102	4.9235	5.4379	5.9531	6.9863	8.0229	9.0626	10.1052	11.1503
125	4.8183	5.3901	5.9628	6.5364	7.6864	8.8397	9.9961	11.1554	12.3171
150	5.1882	5.8129	6.4385	7.0651	8.3208	9.5798	10.842	12.1069	13.3747

Table B-16: σ^2 Unknown C Values for α, P_T, $1-\beta = .2$ [$.35 \leq r \leq 7$]

DF \ r	1.25	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0
2	4.8655	5.7328	7.506	9.3039	11.114	14.752	18.4012	22.0567	25.7155
3	4.643	5.4584	7.1212	8.8079	10.5079	13.9279	17.3618	20.8027	24.2476
4	4.694	5.5169	7.1921	8.8909	10.6029	14.0482	17.5079	20.9754	24.447
5	4.8224	5.6696	7.3923	9.138	10.8971	14.4366	17.9914	21.5539	25.1211
6	4.9778	5.8552	7.6378	9.4431	11.2617	14.9205	18.5947	22.2767	25.9637
7	5.1426	6.0525	7.8994	9.7689	11.6516	15.4387	19.2414	23.0522	26.8677
8	5.3094	6.2524	8.1651	10.1	12.0481	15.9663	19.8999	23.8418	27.7888
9	5.4752	6.451	8.4292	10.4295	12.4429	16.4917	20.5562	24.6288	28.7066
10	5.6382	6.6466	8.6893	10.754	12.8319	17.0096	21.203	25.4049	29.6116
11	5.798	6.8381	8.9442	11.0722	13.2133	17.5176	21.8377	26.1661	30.4995
12	5.954	7.0253	9.1934	11.3834	13.5865	18.0145	22.4586	26.911	31.3685
13	6.1065	7.2081	9.4368	11.6874	13.951	18.5002	23.0654	27.6389	32.2175
14	6.2553	7.3866	9.6746	11.9843	14.307	18.9746	23.6581	28.3499	33.0469
15	6.4006	7.5609	9.9068	12.2744	14.6549	19.4381	24.2373	29.0449	33.8576
16	6.5426	7.7312	10.1337	12.5578	14.9949	19.8911	24.8034	29.7242	34.6497
18	6.8173	8.0607	10.5726	13.1062	15.6526	20.7676	25.8987	31.0383	36.183
20	7.0804	8.3764	10.9933	13.6317	16.2831	21.6078	26.9487	32.2981	37.6525
22	7.3332	8.6797	11.3976	14.1368	16.8889	22.4154	27.958	33.509	39.0654
24	7.5767	8.9719	11.7869	14.6233	17.4727	23.1934	28.9304	34.6758	40.4264
26	7.8118	9.2539	12.1629	15.0931	18.0363	23.9447	29.8693	35.8024	41.7407
28	8.0393	9.5269	12.5267	15.5477	18.5815	24.6716	30.7778	36.8924	43.0124
30	8.2598	9.7914	12.8792	15.9882	19.1102	25.3763	31.6586	37.9493	44.2454
35	8.784	10.4204	13.7178	17.0361	20.3675	27.0524	33.7533	40.463	47.1778
40	9.2754	11.0101	14.5037	18.0184	21.5461	28.6235	35.7172	42.8198	49.927
45	9.7393	11.5668	15.2457	18.9458	22.6587	30.107	37.5713	45.0447	52.5223
50	10.1798	12.0953	15.9503	19.8264	23.7155	31.5157	39.3321	47.1573	54.9877
60	11.0027	13.0827	17.2668	21.4718	25.6897	34.1477	42.622	51.1052	59.5932

Table B-17: σ^2 Unknown C Values for α, P_T, $1-\beta = .2$ $[1.25 \leq r \leq 7]$

DF \ r	0.0	0.001	0.01	0.05	0.1	0.15	0.2	0.25	0.3
1	1.9626	1.9627	1.9629	1.9676	1.9823	2.0067	2.0411	2.085	2.1386
2	1.3862	1.3862	1.3864	1.3914	1.407	1.433	1.4694	1.516	1.5726
3	1.2498	1.2498	1.2501	1.2561	1.2748	1.3061	1.3499	1.406	1.474
4	1.1896	1.1896	1.1899	1.197	1.2194	1.2567	1.3088	1.3756	1.4561
5	1.1558	1.1558	1.1561	1.1645	1.1905	1.2341	1.2949	1.3726	1.4658
6	1.1342	1.1342	1.1346	1.1441	1.174	1.2239	1.2936	1.3822	1.4879
7	1.1192	1.1192	1.1196	1.1304	1.1641	1.2204	1.299	1.3985	1.5162
8	1.1082	1.1082	1.1087	1.1207	1.1582	1.221	1.3085	1.4187	1.5479
9	1.0997	1.0997	1.1003	1.1135	1.1549	1.2242	1.3205	1.4412	1.5815
10	1.0931	1.0931	1.0937	1.1081	1.1535	1.2292	1.3343	1.4652	1.616
11	1.0877	1.0877	1.0883	1.104	1.1533	1.2355	1.3493	1.4901	1.6508
12	1.0832	1.0832	1.0839	1.1009	1.154	1.2428	1.3651	1.5155	1.6857
13	1.0795	1.0795	1.0802	1.0984	1.1555	1.2507	1.3816	1.5412	1.7204
14	1.0763	1.0763	1.0771	1.0965	1.1575	1.2592	1.3984	1.5671	1.7548
15	1.0735	1.0735	1.0744	1.0951	1.16	1.2681	1.4156	1.5929	1.7887
16	1.0711	1.0712	1.0721	1.094	1.1628	1.2774	1.4329	1.6187	1.8221
18	1.0672	1.0672	1.0682	1.0926	1.1693	1.2967	1.468	1.6696	1.8873
20	1.064	1.064	1.0651	1.092	1.1767	1.3166	1.5031	1.7195	1.9503
22	1.0615	1.0615	1.0627	1.0921	1.1846	1.3371	1.5381	1.7682	2.0112
24	1.0593	1.0594	1.0607	1.0926	1.1929	1.3577	1.5728	1.8158	2.0699
26	1.0575	1.0575	1.059	1.0934	1.2016	1.3786	1.607	1.862	2.1268
28	1.056	1.056	1.0575	1.0944	1.2105	1.3995	1.6407	1.907	2.1818
30	1.0547	1.0547	1.0563	1.0957	1.2197	1.4204	1.6739	1.9509	2.2351
35	1.052	1.0521	1.0539	1.0996	1.2431	1.4724	1.7542	2.0556	2.362
40	1.0501	1.0501	1.0522	1.1042	1.2671	1.5235	1.8309	2.1541	2.4808
45	1.0485	1.0486	1.051	1.1092	1.2914	1.5735	1.904	2.2473	2.5929
50	1.0473	1.0473	1.05	1.1145	1.3158	1.6223	1.974	2.3357	2.6992
60	1.0455	1.0455	1.0487	1.1258	1.3647	1.716	2.1053	2.501	2.8977
70	1.0442	1.0442	1.0479	1.1377	1.413	1.8045	2.227	2.6535	3.0809
80	1.0432	1.0433	1.0475	1.1498	1.4606	1.8882	2.3408	2.7959	3.2518
90	1.0425	1.0425	1.0472	1.1622	1.5071	1.9676	2.4478	2.9298	3.4126
100	1.0419	1.0419	1.0471	1.1747	1.5526	2.0431	2.5493	3.0567	3.5648
125	1.0408	1.0409	1.0474	1.2064	1.6614	2.218	2.7831	3.3491	3.9157
150	1.0401	1.0402	1.0479	1.2383	1.7632	2.3766	2.9949	3.6139	4.2335

Table B-18: σ^2 Unknown C Values for α, P_T, $1-\beta = .3$ $[0 \leq r \leq .3]$

DF \ r	0.35	0.4	0.45	0.5	0.6	0.7	0.8	0.9	1.0
1	2.2017	2.2741	2.3555	2.4457	2.6513	2.8873	3.1503	3.4363	3.7418
2	1.639	1.7146	1.7988	1.8908	2.0954	2.3218	2.5643	2.8184	3.0808
3	1.5531	1.6425	1.7409	1.847	2.0771	2.324	2.5815	2.8459	3.1149
4	1.5491	1.6531	1.766	1.886	2.1411	2.4087	2.6835	2.9627	3.2452
5	1.5725	1.6903	1.8167	1.9493	2.2267	2.5132	2.8048	3.0997	3.3972
6	1.6076	1.7383	1.8768	2.0206	2.3177	2.6216	2.9294	3.24	3.5529
7	1.6482	1.7907	1.94	2.0938	2.4088	2.729	3.0524	3.3784	3.7066
8	1.6914	1.8446	2.0038	2.1666	2.498	2.8337	3.1723	3.5132	3.8562
9	1.7357	1.8987	2.0668	2.2379	2.5848	2.9352	3.2883	3.6438	4.0011
10	1.7801	1.9521	2.1286	2.3074	2.6689	3.0335	3.4007	3.7701	4.1415
11	1.8242	2.0046	2.1888	2.3749	2.7503	3.1287	3.5095	3.8924	4.2773
12	1.8678	2.056	2.2474	2.4404	2.8293	3.2209	3.6148	4.011	4.409
13	1.9106	2.1062	2.3044	2.5041	2.9058	3.3103	3.717	4.1259	4.5367
14	1.9526	2.1551	2.3599	2.5659	2.9802	3.3971	3.8163	4.2375	4.6607
15	1.9937	2.2029	2.414	2.6261	3.0526	3.4815	3.9128	4.3461	4.7813
16	2.034	2.2495	2.4666	2.6847	3.123	3.5637	4.0067	4.4518	4.8986
18	2.112	2.3394	2.5681	2.7976	3.2586	3.722	4.1876	4.6553	5.1247
20	2.1868	2.4254	2.665	2.9054	3.388	3.873	4.3602	4.8494	5.3404
22	2.2587	2.5078	2.7579	3.0086	3.512	4.0177	4.5255	5.0354	5.547
24	2.3278	2.5871	2.8471	3.1078	3.631	4.1566	4.6843	5.214	5.7454
26	2.3945	2.6634	2.9331	3.2033	3.7457	4.2905	4.8373	5.3861	5.9366
28	2.459	2.7372	3.0161	3.2956	3.8565	4.4198	4.9851	5.5524	6.1214
30	2.5215	2.8086	3.0965	3.385	3.9638	4.5449	5.1281	5.7132	6.3001
35	2.6697	2.9782	3.2873	3.5971	4.2184	4.8419	5.4676	6.0951	6.7244
40	2.8085	3.1369	3.4659	3.7955	4.4566	5.1198	5.7851	6.4524	7.1213
45	2.9393	3.2864	3.6342	3.9825	4.681	5.3817	6.0845	6.7891	7.4955
50	3.0635	3.4284	3.7939	4.16	4.894	5.6302	6.3685	7.1086	7.8504
60	3.2951	3.6932	4.0918	4.4911	5.2914	6.0938	6.8983	7.7046	8.5126
70	3.5089	3.9375	4.3667	4.7965	5.6579	6.5215	7.387	8.2544	9.1235
80	3.7083	4.1654	4.6231	5.0815	5.9999	6.9204	7.843	8.7674	9.6934
90	3.8959	4.3798	4.8644	5.3495	6.3216	7.2957	8.2719	9.2499	10.2296
100	4.0736	4.5829	5.0929	5.6034	6.6263	7.6512	8.6782	9.707	10.7374
125	4.483	5.0509	5.6193	6.1884	7.3282	8.4702	9.6141	10.7599	11.9073
150	4.8538	5.4746	6.0961	6.7182	7.964	9.2119	10.4618	11.7134	12.9668

Table B-19: σ^2 Unknown C Values for α, P_T, $1-\beta = .3$ [$.35 \leq r \leq 1$]

DF \ r	1.25	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0
2	3.7598	4.4571	5.876	7.3092	8.7488	11.6364	14.5291	17.4247	20.3214
3	3.8007	4.4984	5.9138	7.3434	8.7806	11.666	14.5585	17.4547	20.3531
4	3.9613	4.6875	6.1587	7.6442	9.1374	12.1359	15.1425	18.1531	21.1663
5	4.1498	4.9118	6.4538	8.0101	9.5743	12.715	15.8643	19.0179	22.1741
6	4.3434	5.1429	6.7596	8.3904	10.0291	13.3193	16.6181	19.9215	23.2277
7	4.5347	5.3717	7.0629	8.7682	10.4814	13.9208	17.3692	20.822	24.2776
8	4.7213	5.5949	7.3594	9.1377	10.9241	14.5097	18.1046	21.704	25.3063
9	4.9021	5.8115	7.6472	9.4967	11.3542	15.0824	18.8197	22.5619	26.3068
10	5.0773	6.0213	7.9262	9.8448	11.7715	15.6379	19.5135	23.3943	27.2776
11	5.2469	6.2246	8.1965	10.1822	12.176	16.1765	20.1866	24.2014	28.2191
12	5.4112	6.4215	8.4586	10.5094	12.5683	16.6991	20.8394	24.9846	29.1328
13	5.5707	6.6127	8.713	10.827	12.9491	17.2065	21.4733	25.7452	30.0198
14	5.7255	6.7983	8.9602	11.1357	13.3192	17.6995	22.0895	26.4843	30.882
15	5.8761	6.9789	9.2006	11.4359	13.6793	18.1794	22.689	27.2035	31.721
16	6.0228	7.1547	9.4347	11.7284	14.03	18.6466	23.2729	27.9042	32.5383
18	6.3052	7.4934	9.8859	12.2918	14.7058	19.5472	24.3983	29.2544	34.1135
20	6.5746	7.8166	10.3163	12.8297	15.3509	20.4069	25.4726	30.5435	35.6171
22	6.8327	8.1261	10.7288	13.3449	15.9689	21.2306	26.502	31.7785	37.058
24	7.0807	8.4236	11.1251	13.84	16.5629	22.0223	27.4914	32.9656	38.443
26	7.3196	8.7101	11.507	14.3172	17.1354	22.7853	28.445	34.1098	39.7778
28	7.5504	8.987	11.8759	14.7781	17.6884	23.5224	29.3662	35.2152	41.0673
30	7.7738	9.255	12.233	15.2243	18.2238	24.236	30.2581	36.2854	42.3157
35	8.304	9.8911	13.0808	16.2838	19.4947	25.9303	32.3758	38.8264	45.2802
40	8.8	10.4862	13.874	17.275	20.684	27.5156	34.3572	41.2038	48.0537
45	9.2677	11.0473	14.6218	18.2096	21.8053	29.0105	36.2254	43.446	50.6694
50	9.7113	11.5795	15.3312	19.0962	22.8691	30.4286	37.998	45.5727	53.1507
60	10.5389	12.5726	16.6549	20.7506	24.8543	33.0752	41.3071	49.5425	57.7816

Table B-20: σ^2 Unknown C Values for α, P_T, $1-\beta = .3$ $[1.25 \leq r \leq 7]$

DF \ r	0.0	0.001	0.01	0.05	0.1	0.15	0.2	0.25	0.3
1	1.3764	1.3764	1.3765	1.3798	1.3902	1.4074	1.4316	1.4627	1.5008
2	1.0607	1.0607	1.0608	1.0647	1.0766	1.0966	1.1248	1.1611	1.2057
3	0.9785	0.9785	0.9787	0.9834	0.9981	1.0228	1.0577	1.1029	1.1583
4	0.941	0.941	0.9412	0.9469	0.9646	0.9944	1.0366	1.0913	1.1585
5	0.9196	0.9196	0.9198	0.9265	0.9473	0.9824	1.0322	1.0967	1.1758
6	0.9057	0.9057	0.906	0.9137	0.9376	0.9781	1.0356	1.1101	1.2011
7	0.896	0.896	0.8964	0.905	0.9322	0.9781	1.0433	1.1279	1.2307
8	0.8889	0.8889	0.8893	0.8989	0.9293	0.9807	1.0538	1.1483	1.2627
9	0.8834	0.8834	0.8839	0.8945	0.9281	0.985	1.066	1.1705	1.296
10	0.8791	0.8791	0.8795	0.8912	0.928	0.9905	1.0794	1.1937	1.3301
11	0.8755	0.8755	0.8761	0.8887	0.9288	0.9968	1.0936	1.2177	1.3645
12	0.8726	0.8726	0.8732	0.8868	0.9302	1.0038	1.1085	1.2421	1.3989
13	0.8702	0.8702	0.8708	0.8855	0.932	1.0113	1.1239	1.2668	1.4332
14	0.8681	0.8681	0.8687	0.8844	0.9342	1.0192	1.1396	1.2917	1.4673
15	0.8662	0.8663	0.867	0.8837	0.9368	1.0274	1.1556	1.3166	1.5009
16	0.8647	0.8647	0.8654	0.8831	0.9395	1.0358	1.1718	1.3415	1.5342
18	0.8621	0.8621	0.8629	0.8827	0.9456	1.0533	1.2045	1.391	1.5993
20	0.86	0.86	0.8609	0.8827	0.9523	1.0713	1.2376	1.4398	1.6623
22	0.8583	0.8583	0.8593	0.8831	0.9594	1.0898	1.2706	1.4877	1.7234
24	0.8569	0.8569	0.8579	0.8839	0.9668	1.1085	1.3036	1.5346	1.7824
26	0.8557	0.8557	0.8568	0.8848	0.9745	1.1274	1.3363	1.5805	1.8396
28	0.8547	0.8547	0.8559	0.8859	0.9823	1.1465	1.3688	1.6252	1.8949
30	0.8538	0.8538	0.8551	0.8872	0.9903	1.1657	1.4008	1.6689	1.9486
35	0.852	0.852	0.8536	0.8908	1.0108	1.2136	1.4792	1.7736	2.0763
40	0.8507	0.8507	0.8525	0.8949	1.0319	1.2614	1.5546	1.8723	2.1958
45	0.8497	0.8497	0.8516	0.8992	1.0532	1.3087	1.627	1.9658	2.3085
50	0.8489	0.8489	0.8511	0.9038	1.0749	1.3553	1.6966	2.0546	2.4153
60	0.8477	0.8477	0.8503	0.9135	1.1185	1.4457	1.8277	2.2205	2.6146
70	0.8468	0.8468	0.8498	0.9235	1.1623	1.5323	1.9495	2.3735	2.7983
80	0.8462	0.8462	0.8496	0.9338	1.2059	1.6148	2.0634	2.5163	2.9697
90	0.8457	0.8457	0.8495	0.9443	1.2491	1.6936	2.1707	2.6506	3.1308
100	0.8453	0.8453	0.8495	0.9549	1.2918	1.7688	2.2724	2.7777	3.2834
125	0.8445	0.8446	0.8499	0.9819	1.3956	1.9434	2.5066	3.0706	3.6349
150	0.8441	0.8441	0.8504	1.0094	1.4944	2.1021	2.7187	3.3357	3.9531

Table B-21: σ^2 Unknown C Values for α, P_T, $1-\beta = .4$ $[0 \leq r \leq .3]$

DF \ r	0.35	0.4	0.45	0.5	0.6	0.7	0.8	0.9	1.0
1	1.5458	1.5976	1.6563	1.7216	1.8713	2.0446	2.2388	2.4509	2.6777
2	1.2585	1.3193	1.3878	1.4635	1.634	1.8252	2.0318	2.2492	2.4739
3	1.2239	1.2991	1.3832	1.475	1.6776	1.8978	2.1289	2.3665	2.6081
4	1.2377	1.3277	1.4274	1.5349	1.7668	2.0126	2.2657	2.5228	2.7822
5	1.2685	1.3731	1.4873	1.6089	1.8664	2.1342	2.4068	2.6821	2.959
6	1.3071	1.4252	1.5528	1.6869	1.9666	2.2538	2.5444	2.8369	3.1307
7	1.3493	1.4802	1.6197	1.765	2.0644	2.3692	2.6765	2.9855	3.2956
8	1.3933	1.5359	1.6864	1.8415	2.1587	2.48	2.8032	3.1278	3.4536
9	1.438	1.5914	1.7517	1.9159	2.2495	2.5862	2.9246	3.2643	3.6051
10	1.4828	1.6462	1.8154	1.9879	2.3368	2.6883	3.0412	3.3954	3.7506
11	1.5273	1.6998	1.8774	2.0575	2.421	2.7865	3.1534	3.5216	3.8908
12	1.5712	1.7522	1.9376	2.1249	2.5022	2.8813	3.2617	3.6433	4.026
13	1.6144	1.8034	1.996	2.1902	2.5808	2.9729	3.3664	3.761	4.1567
14	1.6568	1.8532	2.0527	2.2535	2.6568	3.0617	3.4678	3.875	4.2833
15	1.6983	1.9018	2.1078	2.3149	2.7306	3.1478	3.5661	3.9857	4.4062
16	1.739	1.9492	2.1614	2.3746	2.8023	3.2314	3.6617	4.0931	4.5256
18	1.8179	2.0405	2.2646	2.4894	2.9401	3.3922	3.8454	4.2997	4.755
20	1.8935	2.1277	2.363	2.5987	3.0713	3.5452	4.0203	4.4964	4.9735
22	1.9661	2.2111	2.457	2.7032	3.1967	3.6915	4.1874	4.6844	5.1823
24	2.036	2.2913	2.5472	2.8035	3.317	3.8318	4.3478	4.8648	5.3827
26	2.1033	2.3684	2.634	2.8999	3.4328	3.9669	4.5021	5.0384	5.5756
28	2.1684	2.4429	2.7178	2.993	3.5446	4.0973	4.6511	5.2059	5.7617
30	2.2313	2.5149	2.7988	3.0831	3.6526	4.2233	4.7951	5.368	5.9417
35	2.3807	2.6857	2.991	3.2967	3.9089	4.5223	5.1367	5.7522	6.3686
40	2.5204	2.8453	3.1706	3.4962	4.1483	4.8016	5.4559	6.1113	6.7675
45	2.6519	2.9956	3.3397	3.6841	4.3738	5.0647	5.7566	6.4495	7.1433
50	2.7766	3.1382	3.5001	3.8623	4.5876	5.3141	6.0417	6.7702	7.4996
60	3.0091	3.4039	3.7991	4.1945	4.9863	5.7792	6.5732	7.3681	8.1639
70	3.2235	3.6489	4.0747	4.5008	5.3538	6.208	7.0632	7.9193	8.7762
80	3.4234	3.8774	4.3317	4.7864	5.6965	6.6078	7.5201	8.4333	9.3474
90	3.6114	4.0923	4.5735	5.055	6.0189	6.9839	7.9498	8.9167	9.8845
100	3.7895	4.2958	4.8024	5.3093	6.3241	7.3399	8.3567	9.3745	10.3931
125	4.1995	4.7644	5.3296	5.8951	7.027	8.16	9.2939	10.4288	11.5645
150	4.5707	5.1887	5.807	6.4255	7.6634	8.9025	10.1425	11.3833	12.6252

Table B-22: σ^2 Unknown C Values for α, P_T, $1-\beta = .4$ $[.35 \leq r \leq 1]$

DF \ r	1.25	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0
2	3.0546	3.6486	4.8508	6.0593	7.2698	9.6925	12.1159	14.5393	16.9629
3	3.2216	3.8426	5.0953	6.3549	7.6175	10.1465	12.6777	15.2098	17.7426
4	3.4371	4.098	5.4297	6.7684	8.1104	10.7992	13.4908	16.184	18.8776
5	3.6566	4.3595	5.7749	7.1973	8.6233	11.4803	14.3406	17.2026	20.0652
6	3.8702	4.6146	6.1128	7.618	9.1269	12.15	15.1765	18.2049	21.234
7	4.0755	4.8602	6.4387	8.0241	9.6133	12.7972	15.9848	19.1743	22.3647
8	4.2724	5.0958	6.7517	8.4146	10.0811	13.42	16.7627	20.1072	23.4527
9	4.4613	5.3221	7.0525	8.7898	10.5309	14.0188	17.5107	21.0045	24.4993
10	4.6429	5.5396	7.3418	9.1509	10.9637	14.5952	18.2308	21.8683	25.507
11	4.8177	5.7491	7.6206	9.4989	11.3809	15.1511	18.9251	22.7014	26.4787
12	4.9865	5.9514	7.8897	9.8349	11.7839	15.6878	19.5959	23.506	27.4173
13	5.1497	6.147	8.1501	10.1601	12.1738	16.2074	20.245	24.2847	28.3257
14	5.3078	6.3365	8.4025	10.4752	12.5517	16.7108	20.8741	25.0396	29.2062
15	5.4612	6.5205	8.6474	10.7811	12.9185	17.1996	21.485	25.7725	30.0612
16	5.6103	6.6993	8.8855	11.0784	13.2752	17.675	22.0789	26.4851	30.8925
18	5.8969	7.043	9.3433	11.6503	13.9611	18.589	23.2212	27.8555	32.4911
20	6.1698	7.3702	9.7792	12.1948	14.6143	19.4595	24.3091	29.1609	34.0139
22	6.4307	7.6831	10.196	12.7157	15.2391	20.2922	25.3499	30.4096	35.4706
24	6.6811	7.9834	10.5961	13.2155	15.8388	21.0916	26.3487	31.6082	36.8688
26	6.922	8.2724	10.9813	13.6967	16.416	21.861	27.3105	32.7621	38.2151
28	7.1546	8.5514	11.353	14.1612	16.9733	22.6037	28.2387	33.8759	39.5145
30	7.3796	8.8212	11.7126	14.6106	17.5124	23.3223	29.1368	34.9536	40.7717
35	7.913	9.4612	12.5655	15.6763	18.791	25.0269	31.2671	37.5098	43.7539
40	8.4115	10.0592	13.3625	16.6723	19.9861	26.62	33.2583	39.899	46.5412
45	8.8811	10.6227	14.1135	17.6108	21.1121	28.121	35.1344	42.1503	49.1677
50	9.3263	11.1568	14.8255	18.501	22.1797	29.5443	36.9134	44.285	51.658
60	10.1565	12.1528	16.1532	20.1601	24.1708	32.1987	40.2313	48.2664	56.3027

Table B-23: σ^2 Unknown C Values for α, P_T, $1-\beta = .4$ $[1.25 \le r \le 7]$

DF \ r	0.0	0.001	0.01	0.05	0.1	0.15	0.2	0.25	0.3
1	1.0	1.0	1.0001	1.0025	1.01	1.0226	1.0403	1.0631	1.0912
2	0.8165	0.8165	0.8166	0.8196	0.8288	0.8443	0.8662	0.8947	0.9299
3	0.7649	0.7649	0.7651	0.7687	0.7803	0.7997	0.8274	0.8635	0.9085
4	0.7407	0.7407	0.7409	0.7454	0.7594	0.7831	0.8168	0.8612	0.9165
5	0.7267	0.7267	0.7269	0.7322	0.7487	0.7767	0.8169	0.8697	0.9358
6	0.7176	0.7176	0.7178	0.7239	0.743	0.7754	0.822	0.8836	0.9606
7	0.7112	0.7112	0.7114	0.7183	0.74	0.7769	0.8301	0.9006	0.9886
8	0.7064	0.7064	0.7067	0.7144	0.7386	0.7801	0.8401	0.9195	1.0185
9	0.7027	0.7027	0.7031	0.7115	0.7384	0.7845	0.8512	0.9397	1.0496
10	0.6998	0.6998	0.7002	0.7095	0.739	0.7897	0.8633	0.9609	1.0815
11	0.6974	0.6975	0.6979	0.708	0.7401	0.7955	0.876	0.9827	1.1138
12	0.6955	0.6955	0.6959	0.7069	0.7416	0.8017	0.8892	1.005	1.1464
13	0.6938	0.6938	0.6943	0.7061	0.7435	0.8083	0.9028	1.0276	1.179
14	0.6924	0.6924	0.693	0.7055	0.7456	0.8152	0.9168	1.0505	1.2116
15	0.6912	0.6912	0.6918	0.7051	0.7479	0.8223	0.931	1.0735	1.244
16	0.6901	0.6901	0.6907	0.7049	0.7504	0.8296	0.9454	1.0967	1.2762
18	0.6884	0.6884	0.689	0.7049	0.7558	0.8447	0.9747	1.1431	1.3396
20	0.687	0.687	0.6877	0.7052	0.7615	0.8603	1.0045	1.1893	1.4015
22	0.6858	0.6858	0.6866	0.7057	0.7676	0.8763	1.0346	1.2351	1.4617
24	0.6849	0.6849	0.6857	0.7065	0.7739	0.8926	1.0648	1.2803	1.5203
26	0.6841	0.6841	0.685	0.7074	0.7803	0.9091	1.0951	1.3249	1.5771
28	0.6834	0.6834	0.6844	0.7084	0.787	0.9259	1.1253	1.3686	1.6323
30	0.6828	0.6828	0.6838	0.7096	0.7937	0.9428	1.1554	1.4114	1.6859
35	0.6816	0.6816	0.6828	0.7127	0.8111	0.9855	1.2298	1.5149	1.8137
40	0.6807	0.6807	0.6821	0.7162	0.8289	1.0286	1.3025	1.613	1.9334
45	0.68	0.68	0.6816	0.7198	0.8471	1.0718	1.3731	1.7062	2.0463
50	0.6794	0.6795	0.6812	0.7237	0.8656	1.1149	1.4414	1.795	2.1534
60	0.6786	0.6786	0.6807	0.7317	0.9033	1.2001	1.5711	1.961	2.353
70	0.678	0.6781	0.6804	0.74	0.9415	1.283	1.6924	2.1142	2.5371
80	0.6776	0.6776	0.6803	0.7485	0.9802	1.3632	1.8062	2.2572	2.7086
90	0.6772	0.6773	0.6803	0.7571	1.019	1.4404	1.9135	2.3916	2.8699
100	0.677	0.677	0.6804	0.7659	1.0579	1.5147	2.0152	2.5189	3.0227
125	0.6765	0.6765	0.6808	0.7884	1.1541	1.6882	2.2496	2.812	3.3744
150	0.6762	0.6762	0.6813	0.8113	1.248	1.8467	2.4613	3.0773	3.6928

Table B-24: σ^2 Unknown C Values for α, P_T, $1-\beta = .5$ $[0 \leq r \leq .3]$

DF \ r	0.35	0.4	0.45	0.5	0.6	0.7	0.8	0.9	1.0
1	1.1246	1.1633	1.2074	1.2567	1.371	1.5049	1.6563	1.8228	2.0018
2	0.9721	1.0212	1.0773	1.1401	1.2841	1.449	1.6295	1.8209	2.0194
3	0.9624	1.0253	1.0968	1.1763	1.3557	1.5549	1.7662	1.9842	2.2058
4	0.983	1.0602	1.1475	1.2435	1.4553	1.6838	1.9206	2.1612	2.4036
5	1.015	1.1066	1.209	1.3202	1.5605	1.8136	2.072	2.3325	2.594
6	1.0526	1.1581	1.2747	1.3997	1.6646	1.9389	2.2164	2.4952	2.7745
7	1.0932	1.2119	1.3416	1.4788	1.7653	2.0584	2.3535	2.6493	2.9456
8	1.1353	1.2666	1.4082	1.5564	1.862	2.1723	2.4838	2.7958	3.1082
9	1.1783	1.3212	1.4737	1.6317	1.9547	2.281	2.608	2.9355	3.2632
10	1.2215	1.3754	1.5377	1.7046	2.0437	2.385	2.7269	3.0691	3.4116
11	1.2646	1.4286	1.6	1.7751	2.1293	2.4849	2.841	3.1974	3.5541
12	1.3074	1.4808	1.6606	1.8433	2.2116	2.5811	2.9508	3.3209	3.6912
13	1.3498	1.5318	1.7194	1.9093	2.2912	2.6738	3.0568	3.44	3.8235
14	1.3915	1.5817	1.7766	1.9732	2.3681	2.7636	3.1593	3.5553	3.9516
15	1.4326	1.6304	1.8321	2.0352	2.4427	2.8505	3.2587	3.667	4.0756
16	1.4729	1.6779	1.8862	2.0955	2.515	2.935	3.3551	3.7755	4.1961
18	1.5514	1.7697	1.9901	2.2113	2.654	3.097	3.5403	3.9837	4.4274
20	1.6269	1.8573	2.0891	2.3213	2.7861	3.2511	3.7163	4.1817	4.6472
22	1.6996	1.9411	2.1837	2.4264	2.9122	3.3982	3.8844	4.3707	4.8573
24	1.7696	2.0217	2.2744	2.5272	3.0331	3.5393	4.0456	4.552	5.0587
26	1.8371	2.0992	2.3616	2.6242	3.1495	3.6749	4.2006	4.7264	5.2523
28	1.9024	2.174	2.4458	2.7177	3.2617	3.8058	4.3501	4.8946	5.4392
30	1.9656	2.2463	2.5272	2.8081	3.3701	3.9324	4.4947	5.0572	5.6199
35	2.1154	2.4177	2.72	3.0224	3.6272	4.2322	4.8374	5.4426	6.0481
40	2.2555	2.5778	2.9001	3.2225	3.8673	4.5122	5.1574	5.8026	6.448
45	2.3873	2.7285	3.0696	3.4108	4.0933	4.7759	5.4586	6.1415	6.8245
50	2.5123	2.8713	3.2303	3.5893	4.3075	5.0258	5.7442	6.4628	7.1814
60	2.7453	3.1375	3.5298	3.9221	4.7068	5.4916	6.2765	7.0615	7.8467
70	2.9599	3.3829	3.8058	4.2288	5.0748	5.9209	6.7671	7.6134	8.4598
80	3.1601	3.6116	4.0631	4.5147	5.4178	6.3211	7.2245	8.1279	9.0314
90	3.3483	3.8267	4.3051	4.7835	5.7404	6.6974	7.6546	8.6118	9.569
100	3.5265	4.0303	4.5342	5.0381	6.0459	7.0538	8.0617	9.0698	10.078
125	3.9368	4.4993	5.0617	5.6242	6.7492	7.8744	8.9995	10.1248	11.2501
150	4.3083	4.9238	5.5393	6.1548	7.3859	8.6171	9.8484	11.0797	12.3112

Table B-25; σ^2 Unknown C Values for α, P_T, $1-\beta = .5$ $[.35 \le r \le 1]$

DF \ r	1.25	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0
2	2.5319	3.0538	4.1034	5.1523	6.1994	8.2893	10.376	12.4606	14.544
3	2.7668	3.3314	4.463	5.5946	6.7252	8.9841	11.2407	13.4959	15.7503
4	3.0128	3.6241	4.8485	6.0731	7.2972	9.7435	12.1881	14.6317	17.0746
5	3.2496	3.9067	5.2226	6.5389	7.8547	10.485	13.1138	15.7418	18.3692
6	3.4743	4.1754	5.5791	6.9832	8.3871	11.1935	13.9986	16.8031	19.6069
7	3.6875	4.4305	5.918	7.4059	8.8936	11.868	14.8412	17.8136	20.7856
8	3.8902	4.6732	6.2407	7.8086	9.3763	12.5107	15.6442	18.7771	21.9095
9	4.0836	4.9049	6.5489	8.1932	9.8375	13.1251	16.4118	19.6978	22.9836
10	4.2687	5.1268	6.8441	8.5618	10.2794	13.7138	17.1474	20.5804	24.0131
11	4.4465	5.3398	7.1277	8.9159	10.7041	14.2796	17.8544	21.4286	25.0025
12	4.6177	5.5451	7.4009	9.2571	11.1132	14.8248	18.5356	22.246	25.9559
13	4.783	5.7432	7.6646	9.5865	11.5084	15.3514	19.1936	23.0353	26.8768
14	4.9428	5.9348	7.9199	9.9053	11.8907	15.8609	19.8304	23.7994	27.7681
15	5.0978	6.1206	8.1673	10.2144	12.2615	16.355	20.4479	24.5403	28.6324
16	5.2482	6.301	8.4076	10.5146	12.6216	16.8349	21.0476	25.2599	29.4718
18	5.5371	6.6474	8.8691	11.0911	13.3131	17.7566	22.1994	26.6419	31.0841
20	5.8118	6.9769	9.308	11.6395	13.9709	18.6333	23.2952	27.9567	32.6179
22	6.0741	7.2916	9.7273	12.1634	14.5995	19.4711	24.3423	29.213	34.0836
24	6.3258	7.5934	10.1295	12.6659	15.2023	20.2746	25.3465	30.4181	35.4893
26	6.5678	7.8837	10.5164	13.1493	15.7823	21.0477	26.3127	31.5774	36.8421
28	6.8012	8.1638	10.8896	13.6157	16.3418	21.7936	27.245	32.696	38.1469
30	7.027	8.4346	11.2506	14.0667	16.8829	22.5149	28.1465	33.7779	39.4091
35	7.5621	9.0765	12.106	15.1358	18.1656	24.2249	30.2838	36.3423	42.4008
40	8.0618	9.676	12.9051	16.1344	19.3638	25.8222	32.2801	38.7379	45.1956
45	8.5324	10.2406	13.6577	17.0749	20.4922	27.3265	34.1606	40.9942	47.8278
50	8.9784	10.7757	14.3709	17.9664	21.5618	28.7525	35.9428	43.133	50.3229
60	9.8098	11.7733	15.7007	19.6284	23.556	31.411	39.2658	47.1205	54.975

Table B-26: σ^2 Unknown C Values for α, P_T, $1-\beta$ = .5 [$1.25 \leq r \leq 7$]

DF \ r	0.0	0.001	0.01	0.05	0.1	0.15	0.2	0.25	0.3
1	0.7266	0.7266	0.7266	0.7284	0.7338	0.743	0.7559	0.7727	0.7934
2	0.6172	0.6172	0.6173	0.6195	0.6265	0.6383	0.655	0.6768	0.7041
3	0.5844	0.5844	0.5845	0.5873	0.5962	0.6111	0.6325	0.6606	0.696
4	0.5687	0.5687	0.5688	0.5722	0.583	0.6013	0.6276	0.6625	0.7066
5	0.5594	0.5594	0.5596	0.5636	0.5764	0.5982	0.6296	0.6714	0.7247
6	0.5534	0.5534	0.5536	0.5582	0.573	0.5983	0.6349	0.6841	0.7468
7	0.5491	0.5491	0.5493	0.5546	0.5714	0.6002	0.6422	0.6988	0.7713
8	0.5459	0.546	0.5462	0.5521	0.5709	0.6034	0.6508	0.7151	0.7974
9	0.5435	0.5435	0.5438	0.5503	0.5712	0.6073	0.6603	0.7324	0.8248
10	0.5415	0.5415	0.5418	0.549	0.572	0.6118	0.6705	0.7505	0.853
11	0.5399	0.54	0.5403	0.5481	0.5731	0.6166	0.6812	0.7692	0.8818
12	0.5386	0.5386	0.539	0.5474	0.5745	0.6218	0.6922	0.7884	0.9111
13	0.5375	0.5375	0.5379	0.547	0.5762	0.6273	0.7036	0.808	0.9408
14	0.5366	0.5366	0.537	0.5467	0.578	0.633	0.7153	0.828	0.9706
15	0.5357	0.5357	0.5362	0.5465	0.58	0.6389	0.7273	0.8483	1.0006
16	0.535	0.535	0.5355	0.5465	0.582	0.6449	0.7395	0.8688	1.0306
18	0.5338	0.5338	0.5343	0.5466	0.5864	0.6573	0.7644	0.9103	1.0903
20	0.5329	0.5329	0.5334	0.547	0.5911	0.6701	0.7899	0.9522	1.1494
22	0.5321	0.5321	0.5327	0.5476	0.5961	0.6833	0.8159	0.9944	1.2076
24	0.5314	0.5315	0.5321	0.5483	0.6012	0.6968	0.8423	1.0365	1.2646
26	0.5309	0.5309	0.5316	0.5491	0.6064	0.7105	0.869	1.0784	1.3204
28	0.5304	0.5304	0.5312	0.5499	0.6117	0.7245	0.8959	1.1199	1.3748
30	0.53	0.53	0.5308	0.5509	0.6172	0.7387	0.923	1.161	1.4279
35	0.5292	0.5292	0.5302	0.5535	0.6312	0.7749	0.991	1.2613	1.5549
40	0.5286	0.5286	0.5297	0.5563	0.6457	0.8119	1.0588	1.3577	1.6743
45	0.5281	0.5282	0.5294	0.5592	0.6605	0.8496	1.1258	1.4499	1.7872
50	0.5278	0.5278	0.5291	0.5623	0.6756	0.8878	1.1914	1.5382	1.8943
60	0.5272	0.5272	0.5288	0.5686	0.7066	0.9643	1.318	1.7038	2.094
70	0.5268	0.5268	0.5287	0.5752	0.7385	1.0416	1.4378	1.8569	2.2781
80	0.5265	0.5265	0.5286	0.582	0.7712	1.1175	1.5508	1.9999	2.4497
90	0.5263	0.5263	0.5287	0.5889	0.8045	1.1917	1.6578	2.1343	2.6111
100	0.5261	0.5261	0.5288	0.5959	0.8382	1.2639	1.7594	2.2616	2.7639
125	0.5258	0.5258	0.5291	0.6137	0.9237	1.4347	1.9937	2.5548	3.1156
150	0.5255	0.5256	0.5295	0.6321	1.0097	1.5923	2.206	2.8201	3.434

Table B-27: σ^2 Unknown C Values for α, P_T, $1-\beta = .6$ $[0 \leq r \leq .3]$

r / DF	0.35	0.4	0.45	0.5	0.6	0.7	0.8	0.9	1.0
1	0.8182	0.8472	0.8804	0.918	1.0062	1.1113	1.2321	1.3666	1.5125
2	0.7371	0.776	0.8209	0.8721	0.9923	1.1342	1.293	1.4637	1.642
3	0.7391	0.7901	0.8494	0.9167	1.0732	1.2529	1.4472	1.6495	1.8556
4	0.7605	0.8247	0.8989	0.9827	1.1738	1.3862	1.6093	1.8368	2.0658
5	0.79	0.8676	0.9569	1.0566	1.2789	1.5187	1.7655	2.0143	2.2634
6	0.8238	0.9149	1.0188	1.1333	1.383	1.6461	1.9131	2.1809	2.4485
7	0.8601	0.9646	1.0825	1.2105	1.4841	1.7673	2.0526	2.3379	2.6228
8	0.8982	1.0156	1.1465	1.2867	1.5813	1.8825	2.1846	2.4864	2.7877
9	0.9373	1.0672	1.2101	1.3612	1.6747	1.9923	2.3102	2.6277	2.9445
10	0.977	1.1188	1.2727	1.4337	1.7642	2.0973	2.4302	2.7625	3.0942
11	1.0172	1.17	1.3341	1.5041	1.8503	2.1979	2.5452	2.8917	3.2377
12	1.0574	1.2207	1.3941	1.5722	1.9331	2.2947	2.6557	3.016	3.3757
13	1.0975	1.2706	1.4525	1.6383	2.0131	2.388	2.7623	3.1358	3.5088
14	1.1374	1.3196	1.5094	1.7024	2.0904	2.4782	2.8653	3.2517	3.6374
15	1.177	1.3676	1.5649	1.7646	2.1652	2.5655	2.965	3.3638	3.762
16	1.2161	1.4147	1.6189	1.825	2.2379	2.6502	3.0618	3.4727	3.883
18	1.2927	1.5059	1.723	1.9411	2.3773	2.8128	3.2475	3.6816	4.1149
20	1.3671	1.5933	1.8221	2.0514	2.5097	2.9673	3.424	3.88	4.3354
22	1.4391	1.6771	1.9169	2.1568	2.6362	3.1147	3.5925	4.0695	4.5459
24	1.5087	1.7577	2.0077	2.2578	2.7573	3.256	3.7539	4.2511	4.7476
26	1.5759	1.8352	2.0951	2.3549	2.8739	3.3919	3.9092	4.4257	4.9416
28	1.6411	1.9101	2.1794	2.4486	2.9862	3.5229	4.0589	4.5941	5.1287
30	1.7042	1.9825	2.2609	2.5391	3.0948	3.6496	4.2036	4.7569	5.3096
35	1.8541	2.1541	2.454	2.7536	3.3521	3.9498	4.5466	5.1427	5.7381
40	1.9942	2.3143	2.6342	2.9538	3.5924	4.23	4.8668	5.5029	6.1383
45	2.1262	2.4652	2.8039	3.1423	3.8185	4.4938	5.1683	5.842	6.515
50	2.2513	2.6081	2.9646	3.3209	4.0328	4.7438	5.4539	6.1633	6.872
60	2.4844	2.8744	3.2643	3.6538	4.4322	5.2097	5.9864	6.7623	7.5375
70	2.6991	3.1199	3.5403	3.9606	4.8003	5.6391	6.477	7.3142	8.1507
80	2.8993	3.3487	3.7977	4.2465	5.1434	6.0393	6.9344	7.8288	8.7224
90	3.0876	3.5638	4.0397	4.5154	5.466	6.4157	7.3645	8.3126	9.26
100	3.2658	3.7674	4.2688	4.7699	5.7715	6.772	7.7718	8.7708	9.769
125	3.6762	4.2364	4.7964	5.3561	6.4748	7.5926	8.7095	9.8257	10.9411
150	4.0476	4.6609	5.274	5.8867	7.1115	8.3354	9.5584	10.7806	12.0022

Table B-28: σ^2 Unknown C Values for α, P_T, $1-\beta = .6$ $[.35 \leq r \leq 1]$

DF \ r	1.25	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0
2	2.1032	2.5708	3.5032	4.4281	5.3475	7.1762	8.9976	10.8152	12.6305
3	2.3757	2.8956	3.9296	4.9566	5.9789	8.0148	10.0441	12.07	14.0936
4	2.6386	3.2094	4.3448	5.4736	6.598	8.8387	11.0731	13.3041	15.5332
5	2.8848	3.5038	4.7356	5.9609	7.182	9.6163	12.0446	14.4695	16.8925
6	3.1156	3.7801	5.1026	6.419	7.7311	10.3478	12.9585	15.566	18.1716
7	3.3329	4.0403	5.4488	6.8511	8.2493	11.0381	13.8211	16.601	19.3789
8	3.5386	4.2868	5.7767	7.2606	8.7404	11.6925	14.6389	17.5821	20.5235
9	3.7342	4.5212	6.0889	7.6505	9.2079	12.3156	15.4175	18.5164	21.6134
10	3.9211	4.7453	6.3872	8.023	9.6549	12.9112	16.1619	19.4095	22.6552
11	4.1003	4.9601	6.6733	8.3804	10.0836	13.4825	16.8759	20.2662	23.6547
12	4.2727	5.1667	6.9485	8.7242	10.4959	14.0321	17.5628	21.0904	24.6163
13	4.4388	5.366	7.214	9.0559	10.8938	14.5624	18.2255	21.8856	25.5439
14	4.5995	5.5587	7.4706	9.3765	11.2785	15.0751	18.8663	22.6545	26.4409
15	4.7551	5.7453	7.7193	9.6872	11.6512	15.5719	19.4873	23.3996	27.3101
16	4.9062	5.9265	7.9607	9.9888	12.013	16.0542	20.09	24.1227	28.1537
18	5.1959	6.274	8.4238	10.5675	12.7072	16.9796	21.2466	25.5106	29.7728
20	5.4714	6.6044	8.864	11.1175	13.3672	17.8593	22.3461	26.83	31.312
22	5.7343	6.9199	9.2844	11.6429	13.9974	18.6995	23.3962	28.0899	32.782
24	5.9864	7.2222	9.6874	12.1464	14.6016	19.5049	24.4029	29.298	34.1913
26	6.2288	7.513	10.0749	12.6308	15.1827	20.2796	25.3711	30.4598	35.5467
28	6.4626	7.7935	10.4487	13.098	15.7432	21.0268	26.3051	31.5805	36.8542
30	6.6886	8.0646	10.8101	13.5496	16.2852	21.7493	27.2081	32.664	38.1182
35	7.2242	8.7072	11.6666	14.62	17.5694	23.4613	29.3481	35.2319	41.1139
40	7.7242	9.3072	12.4663	15.6195	18.7687	25.0602	31.3465	37.6299	43.9117
45	8.1951	9.872	13.2194	16.5606	19.898	26.5657	33.2282	39.8879	46.546
50	8.6413	10.4074	13.933	17.4525	20.9682	27.9925	35.0117	42.028	49.0427
60	9.4729	11.4053	15.2632	19.1151	22.9631	30.6523	38.3362	46.0175	53.6969

Table B-29: σ^2 Unknown C Values for α, P_T, $1-\beta = .6$ $[1.25 \leq r \leq 7]$

DF \ r	0.0	0.001	0.01	0.05	0.1	0.15	0.2	0.25	0.3
1	0.5095	0.5095	0.5096	0.5108	0.5146	0.5211	0.5302	0.5421	0.5568
2	0.4448	0.4448	0.4448	0.4464	0.4515	0.46	0.4721	0.488	0.5081
3	0.4242	0.4242	0.4243	0.4263	0.4328	0.4437	0.4593	0.48	0.5064
4	0.4142	0.4142	0.4143	0.4168	0.4246	0.438	0.4574	0.4832	0.5164
5	0.4082	0.4082	0.4084	0.4113	0.4206	0.4366	0.4598	0.491	0.5314
6	0.4043	0.4043	0.4045	0.4079	0.4187	0.4373	0.4644	0.5013	0.5492
7	0.4016	0.4016	0.4017	0.4056	0.4179	0.4391	0.4703	0.513	0.5688
8	0.3995	0.3995	0.3997	0.404	0.4178	0.4417	0.4771	0.5258	0.5899
9	0.3979	0.3979	0.3981	0.4029	0.4182	0.4449	0.4845	0.5394	0.612
10	0.3966	0.3966	0.3968	0.4021	0.4189	0.4484	0.4924	0.5537	0.635
11	0.3956	0.3956	0.3958	0.4015	0.4199	0.4522	0.5007	0.5686	0.6588
12	0.3947	0.3947	0.3949	0.4011	0.4211	0.4562	0.5093	0.5839	0.6833
13	0.394	0.394	0.3942	0.4009	0.4224	0.4604	0.5181	0.5996	0.7083
14	0.3933	0.3933	0.3936	0.4008	0.4238	0.4648	0.5272	0.6158	0.7339
15	0.3928	0.3928	0.3931	0.4007	0.4254	0.4692	0.5366	0.6323	0.7598
16	0.3923	0.3923	0.3927	0.4007	0.4269	0.4738	0.5461	0.6491	0.786
18	0.3915	0.3915	0.3919	0.4009	0.4303	0.4833	0.5657	0.6836	0.8392
20	0.3909	0.3909	0.3913	0.4013	0.4339	0.4931	0.5859	0.7191	0.893
22	0.3904	0.3904	0.3909	0.4018	0.4376	0.5033	0.6068	0.7553	0.9468
24	0.39	0.39	0.3905	0.4023	0.4415	0.5136	0.6282	0.7921	1.0004
26	0.3896	0.3896	0.3901	0.403	0.4454	0.5243	0.65	0.8294	1.0536
28	0.3893	0.3893	0.3899	0.4037	0.4495	0.5351	0.6723	0.8669	1.106
30	0.389	0.389	0.3896	0.4044	0.4536	0.5461	0.695	0.9045	1.1575
35	0.3885	0.3885	0.3892	0.4063	0.4642	0.5746	0.7531	0.9983	1.2822
40	0.3881	0.3881	0.3889	0.4085	0.4751	0.6042	0.8127	1.0905	1.4005
45	0.3878	0.3878	0.3887	0.4107	0.4863	0.6347	0.873	1.1801	1.5129
50	0.3875	0.3876	0.3885	0.413	0.4979	0.6661	0.9334	1.2668	1.6197
60	0.3872	0.3872	0.3884	0.4177	0.5217	0.731	1.0531	1.4309	1.8192
70	0.3869	0.3869	0.3883	0.4226	0.5465	0.798	1.1691	1.5835	2.0032
80	0.3867	0.3867	0.3883	0.4277	0.5721	0.866	1.2801	1.7263	2.1748
90	0.3866	0.3866	0.3883	0.4328	0.5985	0.9342	1.3861	1.8607	2.3361
100	0.3864	0.3865	0.3884	0.438	0.6258	1.0021	1.4872	1.988	2.4888
125	0.3862	0.3862	0.3887	0.4514	0.6965	1.1668	1.7211	2.281	2.8405
150	0.3861	0.3861	0.389	0.4652	0.7703	1.3219	1.9333	2.5463	3.1588

Table B-30: σ^2 Unknown C Values for α, P_T, $1-\beta = .7$ $[0 \leq r \leq .3]$

DF \ r	0.35	0.4	0.45	0.5	0.6	0.7	0.8	0.9	1.0
1	0.5746	0.5956	0.6198	0.6475	0.7136	0.7946	0.8901	0.9988	1.1187
2	0.5325	0.5617	0.5959	0.6354	0.7314	0.8494	0.9867	1.1384	1.2995
3	0.5388	0.5779	0.6241	0.678	0.8084	0.966	1.143	1.331	1.5241
4	0.5575	0.6075	0.667	0.7362	0.9018	1.0956	1.3053	1.5215	1.7395
5	0.5819	0.6435	0.7169	0.8017	1.001	1.2259	1.4619	1.701	1.9399
6	0.6095	0.6833	0.7709	0.8712	1.1012	1.3523	1.6103	1.869	2.1268
7	0.6394	0.7258	0.8275	0.9426	1.1998	1.4732	1.7503	2.0269	2.3021
8	0.6711	0.7701	0.8857	1.0145	1.2957	1.5885	1.8828	2.176	2.4677
9	0.7041	0.8158	0.9445	1.0859	1.3882	1.6984	2.0087	2.3176	2.6249
10	0.7381	0.8622	1.0035	1.1562	1.4773	1.8035	2.1289	2.4527	2.7749
11	0.773	0.9092	1.0621	1.2251	1.5632	1.9042	2.244	2.5821	2.9186
12	0.8085	0.9563	1.1199	1.2923	1.646	2.001	2.3546	2.7064	3.0567
13	0.8445	1.0033	1.1768	1.3577	1.7259	2.0944	2.4612	2.8263	3.1898
14	0.8807	1.05	1.2326	1.4213	1.8032	2.1846	2.5642	2.9421	3.3184
15	0.9171	1.0962	1.2872	1.4832	1.8781	2.2719	2.6639	3.0542	3.443
16	0.9535	1.1418	1.3407	1.5434	1.9507	2.3566	2.7607	3.163	3.5638
18	1.0259	1.231	1.444	1.6593	2.0901	2.5191	2.9463	3.3717	3.7957
20	1.0972	1.3172	1.5427	1.7695	2.2225	2.6735	3.1226	3.5701	4.0159
22	1.1671	1.4003	1.6373	1.8748	2.3488	2.8208	3.2909	3.7593	4.2262
24	1.2353	1.4804	1.7281	1.9758	2.4699	2.962	3.4522	3.9408	4.4278
26	1.3017	1.5577	1.8154	2.0729	2.5863	3.0978	3.6074	4.1152	4.6216
28	1.3662	1.6325	1.8996	2.1665	2.6986	3.2287	3.757	4.2835	4.8085
30	1.4289	1.7048	1.9811	2.257	2.8071	3.3553	3.9015	4.4461	4.9892
35	1.5782	1.8762	2.1741	2.4713	3.0642	3.6551	4.2442	4.8315	5.4173
40	1.7181	2.0364	2.3542	2.6714	3.3043	3.9351	4.564	5.1913	5.8171
45	1.85	2.1871	2.5237	2.8598	3.5302	4.1987	4.8652	5.5301	6.1934
50	1.975	2.33	2.6844	3.0382	3.7443	4.4484	5.1506	5.8511	6.5501
60	2.208	2.5962	2.9838	3.3709	4.1434	4.9139	5.6826	6.4495	7.215
70	2.4227	2.8415	3.2598	3.6774	4.5112	5.343	6.1729	7.0011	7.8277
80	2.6228	3.0702	3.517	3.9632	4.8541	5.7429	6.6299	7.5152	8.399
90	2.8109	3.2852	3.7588	4.2319	5.1765	6.1191	7.0598	7.9988	8.9363
100	2.9891	3.4888	3.9878	4.4863	5.4818	6.4752	7.4667	8.4566	9.4449
125	3.3993	3.9575	4.5152	5.0722	6.1848	7.2953	8.404	9.511	10.6164
150	3.7706	4.3819	4.9925	5.6026	6.8212	8.0377	9.2525	10.4655	11.6769

Table B-31: σ^2 Unknown C Values for α, P_T, $1-\beta = .7$ $[.35 \leq r \leq 1]$

DF \ r	1.25	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0
2	1.7196	2.1439	2.9807	3.8025	4.6146	6.2226	7.8191	9.4098	10.9971
3	2.011	2.4939	3.4443	4.3802	5.3072	7.1457	8.9732	10.7949	12.6131
4	2.2821	2.8183	3.8752	4.9182	5.9525	8.0062	10.0489	12.0859	14.1194
5	2.5325	3.1182	4.2742	5.4166	6.5505	8.8034	11.0456	13.282	15.5149
6	2.7657	3.3975	4.6461	5.8812	7.1079	9.5467	11.9746	14.3969	16.8159
7	2.9844	3.6597	4.9953	6.3175	7.6314	10.2446	12.8472	15.4439	18.0374
8	3.1911	3.9074	5.3253	6.7298	8.1261	10.9042	13.6716	16.4334	19.1917
9	3.3873	4.1427	5.6388	7.1216	8.5962	11.5309	14.455	17.3734	20.2884
10	3.5746	4.3673	5.938	7.4955	9.0449	12.1291	15.2027	18.2707	21.3353
11	3.754	4.5825	6.2247	7.8539	9.4748	12.7023	15.9193	19.1306	22.3385
12	3.9265	4.7894	6.5004	8.1984	9.8881	13.2534	16.6081	19.9571	23.3028
13	4.0927	4.9887	6.7661	8.5305	10.2866	13.7847	17.2722	20.7541	24.2326
14	4.2534	5.1815	7.023	8.8514	10.6718	14.2982	17.9141	21.5243	25.1311
15	4.409	5.3681	7.2717	9.1624	11.0449	14.7955	18.5358	22.2703	26.0015
16	4.56	5.5492	7.5131	9.4641	11.4069	15.2782	19.1391	22.9942	26.846
18	4.8496	5.8967	7.9763	10.0429	12.1013	16.2042	20.2964	24.3831	28.4664
20	5.1248	6.2268	8.4163	10.5929	12.7613	17.084	21.3963	25.7029	30.0062
22	5.3876	6.5421	8.8365	11.1181	13.3915	17.9242	22.4464	26.9631	31.4763
24	5.6394	6.8442	9.2393	11.6214	13.9955	18.7295	23.453	28.171	32.8855
26	5.8816	7.1348	9.6266	12.1055	14.5763	19.504	24.421	29.3325	34.2406
28	6.1151	7.415	10.0001	12.5724	15.1366	20.2509	25.3547	30.4529	35.5478
30	6.3409	7.6859	10.3613	13.0238	15.6782	20.973	26.2572	31.5359	36.8114
35	6.876	8.3278	11.217	14.0934	16.9617	22.6842	28.3962	34.1027	39.8058
40	7.3756	8.9273	12.0162	15.0922	18.1602	24.2821	30.3936	36.4995	42.6021
45	7.8459	9.4917	12.7686	16.0326	19.2887	25.7867	32.2743	38.7563	45.2351
50	8.2918	10.0266	13.4817	16.924	20.3581	27.2126	34.0567	40.8951	47.7304
60	9.1227	11.0237	14.811	18.5854	22.3519	29.8708	37.3793	44.8822	52.382

Table B-32: σ^2 Unknown C Values for α, P_T, $1-\beta = .7$ $[1.25 \leq r \leq 7]$

DF \ r	0.0	0.001	0.01	0.05	0.1	0.15	0.2	0.25	0.3
1	0.3249	0.3249	0.325	0.3257	0.3282	0.3323	0.3382	0.3458	0.3553
2	0.2887	0.2887	0.2887	0.2898	0.293	0.2986	0.3065	0.3169	0.3301
3	0.2767	0.2767	0.2767	0.2781	0.2823	0.2894	0.2997	0.3133	0.3308
4	0.2707	0.2707	0.2708	0.2724	0.2776	0.2864	0.2991	0.3162	0.3384
5	0.2672	0.2672	0.2673	0.2692	0.2753	0.2858	0.3011	0.3219	0.349
6	0.2648	0.2648	0.2649	0.2672	0.2743	0.2865	0.3044	0.329	0.3615
7	0.2632	0.2632	0.2633	0.2658	0.2739	0.2879	0.3086	0.3372	0.3752
8	0.2619	0.2619	0.262	0.2649	0.274	0.2898	0.3133	0.346	0.39
9	0.261	0.261	0.2611	0.2642	0.2743	0.2919	0.3183	0.3554	0.4056
10	0.2602	0.2602	0.2603	0.2638	0.2749	0.2943	0.3237	0.3653	0.4221
11	0.2596	0.2596	0.2597	0.2635	0.2756	0.2969	0.3293	0.3756	0.4392
12	0.259	0.259	0.2592	0.2633	0.2764	0.2997	0.3352	0.3863	0.4571
13	0.2586	0.2586	0.2588	0.2632	0.2773	0.3025	0.3412	0.3973	0.4755
14	0.2582	0.2582	0.2584	0.2631	0.2783	0.3054	0.3475	0.4087	0.4946
15	0.2579	0.2579	0.2581	0.2631	0.2793	0.3085	0.3539	0.4205	0.5143
16	0.2576	0.2576	0.2578	0.2631	0.2804	0.3116	0.3604	0.4326	0.5345
18	0.2571	0.2571	0.2574	0.2633	0.2827	0.318	0.3739	0.4576	0.5764
20	0.2567	0.2567	0.257	0.2636	0.2851	0.3246	0.388	0.4839	0.6201
22	0.2564	0.2564	0.2567	0.2639	0.2876	0.3315	0.4027	0.5112	0.6651
24	0.2562	0.2562	0.2565	0.2643	0.2902	0.3385	0.4178	0.5396	0.7112
26	0.256	0.256	0.2563	0.2647	0.2928	0.3457	0.4335	0.5689	0.7581
28	0.2558	0.2558	0.2561	0.2652	0.2955	0.3531	0.4497	0.599	0.8054
30	0.2556	0.2556	0.256	0.2657	0.2983	0.3607	0.4663	0.6299	0.8528
35	0.2553	0.2553	0.2558	0.267	0.3054	0.3804	0.5098	0.7097	0.9705
40	0.255	0.2551	0.2556	0.2684	0.3127	0.4011	0.5559	0.7916	1.0852
45	0.2549	0.2549	0.2554	0.2699	0.3203	0.4227	0.6042	0.8742	1.1956
50	0.2547	0.2547	0.2554	0.2715	0.328	0.4453	0.6543	0.9562	1.3014
60	0.2545	0.2545	0.2553	0.2746	0.3442	0.4932	0.7583	1.1154	1.5002
70	0.2543	0.2543	0.2552	0.2779	0.3611	0.5445	0.8642	1.2661	1.6839
80	0.2542	0.2542	0.2552	0.2812	0.3788	0.5987	0.9693	1.4081	1.8552
90	0.2541	0.2541	0.2553	0.2846	0.3973	0.6552	1.0719	1.5422	2.0164
100	0.254	0.254	0.2553	0.2881	0.4165	0.7134	1.1712	1.6693	2.169
125	0.2539	0.2539	0.2555	0.297	0.4677	0.8623	1.4034	1.9621	2.5204
150	0.2538	0.2538	0.2557	0.3062	0.5232	1.0098	1.6152	2.2272	2.8384

Table B-33: σ^2 Unknown C Values for α, P_T, $1-\beta = .8$ $[0 \leq r \leq .3]$

DF \ r	0.35	0.4	0.45	0.5	0.6	0.7	0.8	0.9	1.0
1	0.3669	0.3806	0.3966	0.4151	0.4602	0.5173	0.5875	0.6708	0.7663
2	0.3463	0.3659	0.3891	0.4164	0.4848	0.5738	0.684	0.8131	0.9559
3	0.3525	0.3791	0.4111	0.4493	0.5465	0.6731	0.8262	0.9974	1.1778
4	0.3662	0.4007	0.4428	0.4934	0.6227	0.788	0.9794	1.1837	1.392
5	0.3835	0.4268	0.4799	0.5442	0.7072	0.9087	1.1315	1.3614	1.5918
6	0.4032	0.4559	0.5211	0.5999	0.7964	1.0294	1.2775	1.5285	1.7781
7	0.4246	0.4875	0.5655	0.6593	0.8874	1.1472	1.4164	1.6857	1.9528
8	0.4476	0.5213	0.6126	0.7213	0.9782	1.2607	1.5481	1.8342	2.1176
9	0.4719	0.5569	0.6617	0.7848	1.0676	1.3695	1.6734	1.9751	2.2741
10	0.4974	0.5941	0.7124	0.8491	1.1547	1.474	1.7931	2.1096	2.4233
11	0.524	0.6327	0.7641	0.9135	1.2393	1.5742	1.9077	2.2384	2.5663
12	0.5517	0.6723	0.8165	0.9774	1.3212	1.6706	2.0178	2.3622	2.7037
13	0.5803	0.7129	0.869	1.0404	1.4005	1.7636	2.124	2.4814	2.8361
14	0.6096	0.754	0.9214	1.1023	1.4774	1.8534	2.2266	2.5967	2.9641
15	0.6397	0.7955	0.9735	1.163	1.5519	1.9404	2.3259	2.7083	3.0881
16	0.6704	0.8373	1.0249	1.2224	1.6243	2.0248	2.4222	2.8166	3.2083
18	0.7332	0.9207	1.1256	1.3372	1.7632	2.1867	2.6071	3.0244	3.4391
20	0.797	1.003	1.2228	1.4468	1.8952	2.3405	2.7827	3.2219	3.6584
22	0.8613	1.0837	1.3165	1.5517	2.0212	2.4874	2.9503	3.4104	3.8678
24	0.9253	1.1622	1.4067	1.6523	2.1419	2.6281	3.111	3.5911	4.0686
26	0.9887	1.2386	1.4937	1.7492	2.258	2.7634	3.2656	3.7649	4.2616
28	1.0511	1.3126	1.5776	1.8425	2.3699	2.8938	3.4146	3.9325	4.4478
30	1.1123	1.3845	1.6589	1.9328	2.4781	3.02	3.5587	4.0946	4.6279
35	1.2596	1.5554	1.8514	2.1467	2.7345	3.319	3.9003	4.4787	5.0546
40	1.3987	1.7152	2.0312	2.3464	2.974	3.5982	4.2193	4.8375	5.4532
45	1.5301	1.8657	2.2005	2.5343	3.1994	3.8611	4.5196	5.1753	5.8285
50	1.6549	2.0083	2.3609	2.7125	3.413	4.1102	4.8043	5.4956	6.1842
60	1.8875	2.2741	2.6598	3.0445	3.8113	4.5747	5.3351	6.0926	6.8476
70	2.102	2.5191	2.9353	3.3506	4.1784	5.0029	5.8244	6.643	7.4591
80	2.3018	2.7475	3.1921	3.6359	4.5207	5.4022	6.2807	7.1563	8.0294
90	2.4898	2.9622	3.4337	3.9042	4.8426	5.7777	6.7098	7.639	8.5657
100	2.6678	3.1655	3.6624	4.1583	5.1475	6.1333	7.1161	8.0961	9.0737
125	3.0776	3.6338	4.1891	4.7435	5.8496	6.9524	8.0522	9.1491	10.2436
150	3.4486	4.0578	4.666	5.2733	6.4853	7.694	8.8997	10.1026	11.3029

Table B-34: σ^2 Unknown C Values for α, P_T, $1-\beta$ = .8 [.35 $\leq$ r $\leq$ 1]

DF \ r:	1.25	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0
2	1.3399	1.7286	2.4837	3.2137	3.9289	5.3355	6.7257	8.1078	9.4851
3	1.6367	2.088	2.963	3.8137	4.6504	6.3004	7.934	9.5594	11.1797
4	1.9092	2.4148	3.3985	4.3589	5.3054	7.1756	9.0293	10.8745	12.7148
5	2.1596	2.7149	3.7986	4.8595	5.9068	7.9784	10.0337	12.0804	14.122
6	2.3922	2.9936	4.1702	5.3243	6.4649	8.7234	10.9655	13.199	15.4274
7	2.61	3.2548	4.5185	5.7599	6.9879	9.4213	11.8384	14.2467	16.6499
8	2.8157	3.5014	4.8472	6.171	7.4816	10.08	12.6619	15.2352	17.8034
9	3.0109	3.7356	5.1595	6.5615	7.9503	10.7052	13.4438	16.1736	18.8983
10	3.1972	3.959	5.4574	6.934	8.3975	11.3018	14.1896	17.0687	19.9427
11	3.3756	4.173	5.7428	7.2909	8.8259	11.8732	14.904	17.9262	20.9432
12	3.5472	4.3789	6.0172	7.634	9.2376	12.4224	15.5907	18.7504	21.9048
13	3.7126	4.5773	6.2818	7.9648	9.6346	12.9518	16.2527	19.5448	22.8317
14	3.8725	4.769	6.5375	8.2844	10.0183	13.4636	16.8924	20.3125	23.7274
15	4.0273	4.9548	6.7851	8.5941	10.3899	13.9592	17.512	21.0561	24.5949
16	4.1775	5.135	7.0255	8.8946	10.7506	14.4401	18.1132	21.7776	25.4368
18	4.4658	5.4809	7.4866	9.4711	11.4424	15.3628	19.2668	23.1619	27.0519
20	4.7398	5.8096	7.9249	10.019	12.1	16.2397	20.3629	24.4774	28.5867
22	5.0014	6.1236	8.3435	10.5422	12.7279	17.077	21.4097	25.7335	30.0522
24	5.2522	6.4245	8.7447	11.0438	13.3299	17.8798	22.4131	26.9377	31.4571
26	5.4935	6.7139	9.1306	11.5263	13.9089	18.6518	23.3783	28.0959	32.8084
28	5.7262	6.9931	9.5029	11.9916	14.4673	19.3965	24.3092	29.213	34.1117
30	5.9512	7.2631	9.8628	12.4416	15.0073	20.1165	25.2092	30.2931	35.3718
35	6.4845	7.903	10.716	13.5081	16.2872	21.8231	27.3425	32.8531	38.3587
40	6.9826	8.5007	11.5129	14.5042	17.4826	23.417	29.3349	35.2441	41.1481
45	7.4517	9.0636	12.2634	15.4424	18.6084	24.9181	31.2113	37.4958	43.7752
50	7.8963	9.5971	12.9748	16.3316	19.6754	26.3409	32.99	39.6301	46.2653
60	8.7254	10.5919	14.3012	17.9897	21.6652	28.9939	36.3062	43.6097	50.9081

Table B-35: σ^2 Unknown C Values for α, P_T, $1-\beta = .8$ $[1.25 \leq r \leq 7]$

DF \ r	0.0	0.001	0.01	0.05	0.1	0.15	0.2	0.25	0.3
1	0.1584	0.1584	0.1584	0.1588	0.16	0.162	0.1649	0.1686	0.1733
2	0.1421	0.1421	0.1422	0.1427	0.1443	0.147	0.1509	0.1561	0.1626
3	0.1366	0.1366	0.1366	0.1373	0.1394	0.1429	0.148	0.1548	0.1635
4	0.1338	0.1338	0.1339	0.1347	0.1372	0.1416	0.1479	0.1564	0.1675
5	0.1322	0.1322	0.1322	0.1332	0.1362	0.1414	0.149	0.1594	0.173
6	0.1311	0.1311	0.1311	0.1322	0.1357	0.1418	0.1508	0.1631	0.1794
7	0.1303	0.1303	0.1303	0.1316	0.1356	0.1426	0.1529	0.1672	0.1865
8	0.1297	0.1297	0.1298	0.1312	0.1357	0.1435	0.1553	0.1717	0.1941
9	0.1293	0.1293	0.1293	0.1309	0.1359	0.1446	0.1578	0.1765	0.2023
10	0.1289	0.1289	0.129	0.1307	0.1362	0.1459	0.1605	0.1816	0.2108
11	0.1286	0.1286	0.1287	0.1305	0.1366	0.1472	0.1634	0.1869	0.2199
12	0.1284	0.1284	0.1284	0.1305	0.137	0.1485	0.1664	0.1924	0.2294
13	0.1282	0.1282	0.1282	0.1304	0.1374	0.15	0.1694	0.1981	0.2393
14	0.128	0.128	0.1281	0.1304	0.1379	0.1515	0.1726	0.204	0.2497
15	0.1278	0.1278	0.1279	0.1304	0.1385	0.153	0.1758	0.2101	0.2605
16	0.1277	0.1277	0.1278	0.1304	0.139	0.1545	0.1792	0.2165	0.2718
18	0.1275	0.1275	0.1276	0.1305	0.1401	0.1578	0.1861	0.2298	0.2957
20	0.1273	0.1273	0.1274	0.1307	0.1414	0.1611	0.1934	0.2439	0.3215
22	0.1271	0.1271	0.1273	0.1308	0.1426	0.1646	0.2009	0.2588	0.3492
24	0.127	0.127	0.1272	0.131	0.1439	0.1681	0.2088	0.2747	0.3787
26	0.1269	0.1269	0.1271	0.1313	0.1452	0.1718	0.217	0.2914	0.4101
28	0.1268	0.1268	0.127	0.1315	0.1466	0.1756	0.2256	0.309	0.4431
30	0.1267	0.1267	0.1269	0.1317	0.148	0.1794	0.2344	0.3275	0.4777
35	0.1266	0.1266	0.1268	0.1324	0.1515	0.1895	0.2581	0.3777	0.5701
40	0.1265	0.1265	0.1267	0.1331	0.1552	0.2002	0.2839	0.4333	0.668
45	0.1264	0.1264	0.1267	0.1339	0.159	0.2114	0.312	0.4937	0.7682
50	0.1263	0.1263	0.1266	0.1346	0.1629	0.2233	0.3425	0.5582	0.8682
60	0.1262	0.1262	0.1266	0.1362	0.1711	0.249	0.4101	0.6947	1.062
70	0.1261	0.1261	0.1266	0.1378	0.1797	0.2775	0.4861	0.8344	1.2442
80	0.1261	0.1261	0.1266	0.1395	0.1887	0.3088	0.5688	0.9716	1.415
90	0.126	0.126	0.1266	0.1412	0.1982	0.343	0.656	1.1035	1.5759
100	0.126	0.126	0.1266	0.1429	0.2082	0.38	0.7454	1.2297	1.7282
125	0.1259	0.1259	0.1267	0.1474	0.2353	0.4845	0.9669	1.5219	2.0791
150	0.1259	0.1259	0.1268	0.152	0.2655	0.6024	1.176	1.7867	2.3968

Table B-36: σ^2 Unknown C Values for α, P_T, $1-\beta = .9$ $[0 \leq r \leq .3]$

DF \ r	0.35	0.4	0.45	0.5	0.6	0.7	0.8	0.9	1.0
1	0.179	0.1858	0.1938	0.2031	0.2263	0.2567	0.2959	0.3458	0.4078
2	0.1707	0.1806	0.1923	0.2063	0.2425	0.2922	0.3595	0.4476	0.557
3	0.1744	0.1879	0.2043	0.2243	0.2775	0.3536	0.4584	0.593	0.7507
4	0.1816	0.1993	0.2212	0.2484	0.3227	0.4312	0.5785	0.7574	0.9527
5	0.1906	0.213	0.2412	0.2768	0.3761	0.5215	0.7104	0.9248	1.147
6	0.2008	0.2285	0.264	0.3093	0.4372	0.6207	0.8457	1.087	1.3301
7	0.2121	0.2456	0.2892	0.3455	0.5047	0.7247	0.9789	1.2414	1.5022
8	0.2242	0.2642	0.3169	0.3854	0.5774	0.83	1.1076	1.3878	1.6647
9	0.2372	0.2843	0.3471	0.4289	0.6535	0.9341	1.231	1.5271	1.8191
10	0.2511	0.306	0.3796	0.4754	0.7314	1.0356	1.3492	1.66	1.9664
11	0.2658	0.3291	0.4144	0.5248	0.8098	1.1341	1.4626	1.7873	2.1075
12	0.2814	0.3538	0.4514	0.5763	0.8876	1.2293	1.5717	1.9097	2.2431
13	0.2979	0.3799	0.4903	0.6296	0.9643	1.3214	1.6768	2.0277	2.374
14	0.3152	0.4074	0.5309	0.6839	1.0394	1.4104	1.7785	2.1417	2.5004
15	0.3334	0.4363	0.5729	0.7387	1.1127	1.4967	1.8768	2.2521	2.6229
16	0.3525	0.4665	0.6161	0.7938	1.1842	1.5805	1.9723	2.3593	2.7419
18	0.3933	0.5301	0.7045	0.9029	1.3219	1.7412	2.1555	2.565	2.9702
20	0.4373	0.5974	0.794	1.0096	1.453	1.8939	2.3296	2.7605	3.1872
22	0.4842	0.6669	0.8829	1.1128	1.5783	2.0396	2.4958	2.9474	3.3946
24	0.5337	0.7377	0.9703	1.2124	1.6983	2.1793	2.6553	3.1265	3.5935
26	0.5853	0.8087	1.0556	1.3086	1.8138	2.3137	2.8086	3.2988	3.7849
28	0.6383	0.8792	1.1385	1.4015	1.9251	2.4434	2.9566	3.4651	3.9695
30	0.6923	0.9487	1.2191	1.4914	2.0327	2.5687	3.0997	3.626	4.1482
35	0.8285	1.1166	1.4106	1.7044	2.2878	2.8658	3.4389	4.0074	4.5717
40	0.9624	1.2752	1.5898	1.9033	2.526	3.1434	3.7559	4.3638	4.9677
45	1.0916	1.4251	1.7585	2.0905	2.7504	3.4049	4.0545	4.6996	5.3407
50	1.2153	1.5673	1.9184	2.268	2.9631	3.6528	4.3377	5.0181	5.6945
60	1.4471	1.8324	2.2164	2.5989	3.3597	4.1152	4.8659	5.6122	6.3545
70	1.661	2.0768	2.4911	2.9039	3.7254	4.5417	5.3532	6.1603	6.9633
80	1.8605	2.3046	2.7472	3.1884	4.0665	4.9395	5.8077	6.6715	7.5313
90	2.0481	2.5188	2.9881	3.4559	4.3874	5.3138	6.2353	7.1526	8.0658
100	2.2257	2.7217	3.2162	3.7094	4.6914	5.6683	6.6404	7.6082	8.572
125	2.6348	3.1891	3.7418	4.2931	5.3917	6.4851	7.5738	8.6582	9.7386
150	3.0052	3.6122	4.2177	4.8219	6.026	7.2251	8.4194	9.6094	10.7954

Table B-37: σ^2 Unknown C Values for α, P_T, $1-\beta = .9$ $[.35 \le r \le 1]$

DF \ r	1.25	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0
2	0.8933	1.2524	1.9353	2.5763	3.1938	4.3934	5.5696	6.7341	7.892
3	1.1815	1.6065	2.4094	3.1721	3.9126	5.3585	6.7806	8.1905	9.5934
4	1.4487	1.9272	2.8371	3.7086	4.5585	6.2236	7.8646	9.4931	11.1147
5	1.6947	2.2213	3.2293	4.2003	5.1499	7.0146	8.8551	10.6831	12.5037
6	1.9231	2.4946	3.5938	4.6567	5.6987	7.748	9.7731	11.7856	13.7908
7	2.1371	2.7509	3.9356	5.0847	6.213	8.4351	10.6329	12.8179	14.9958
8	2.3393	2.9931	4.2586	5.489	6.6986	9.0838	11.4445	13.7924	16.1329
9	2.5313	3.2233	4.5656	5.8731	7.1602	9.6998	12.2151	14.7177	17.2128
10	2.7147	3.4431	4.8587	6.24	7.6007	10.288	12.9509	15.6009	18.2433
11	2.8905	3.6538	5.1399	6.5916	8.023	10.8517	13.6558	16.4473	19.231
12	3.0596	3.8566	5.4103	6.9299	8.4293	11.3938	14.3339	17.261	20.1806
13	3.2227	4.0522	5.6711	7.2563	8.8211	11.9167	14.9877	18.046	21.0965
14	3.3805	4.2414	5.9235	7.5718	9.2	12.4222	15.62	18.8047	21.982
15	3.5333	4.4247	6.168	7.8777	9.5672	12.9121	16.2326	19.5401	22.8398
16	3.6817	4.6027	6.4053	8.1746	9.9236	13.3878	16.8272	20.2538	23.6728
18	3.9667	4.9445	6.8611	8.7446	10.6079	14.3007	17.9689	21.6238	25.2715
20	4.2377	5.2696	7.2947	9.2867	11.2588	15.1689	19.0543	22.9268	26.7916
22	4.4966	5.5803	7.7091	9.8049	11.8807	15.9985	20.0916	24.1718	28.244
24	4.745	5.8783	8.1065	10.3019	12.4773	16.7942	21.0864	25.3656	29.6371
26	4.9841	6.1651	8.489	10.7802	13.0513	17.5598	22.0436	26.5144	30.9774
28	5.2148	6.4419	8.8581	11.2417	13.6053	18.2986	22.9673	27.6229	32.2709
30	5.438	6.7096	9.2151	11.6881	14.1411	19.0133	23.8608	28.6952	33.5219
35	5.9672	7.3447	10.062	12.7469	15.4118	20.708	25.9796	31.2378	36.4885
40	6.4619	7.9383	10.8536	13.7365	16.5996	22.292	27.9597	33.6141	39.2611
45	6.9281	8.4977	11.5995	14.669	17.7188	23.7846	29.8257	35.8535	41.8735
50	7.3702	9.0282	12.307	15.5534	18.7802	25.2001	31.595	37.9768	44.3511
60	8.195	10.018	13.6268	17.2035	20.7605	27.8406	34.8961	41.9383	48.9727

Table B-38: σ^2 Unknown C Values for α, P_T, $1-\beta = .9$ $[1.25 \leq r \leq 7]$

DF \ r	0.0	0.001	0.01	0.05	0.1	0.15	0.2	0.25	0.3
1	0.07871	0.07871	0.07871	0.07891	0.0795	0.0805	0.08192	0.08378	0.08612
2	0.0708	0.0708	0.07082	0.07107	0.07188	0.07324	0.07519	0.07776	9.08104
3	0.06809	0.06809	0.0681	0.06844	0.06947	0.07123	0.07377	0.07716	0.08152
4	0.06673	0.06674	0.06675	0.06715	0.06842	0.0706	0.07375	0.07801	0.08356
5	0.06592	0.06592	0.06594	0.06642	0.06793	0.07052	0.07432	0.07951	0.08633
6	0.06538	0.06538	0.0654	0.06595	0.0677	0.07074	0.0752	0.08136	0.08956
7	0.06499	0.06499	0.06503	0.06564	0.06765	0.07111	0.07626	0.08345	0.09313
8	0.0647	0.0647	0.06474	0.06544	0.06768	0.07159	0.07747	0.0857	0.09698
9	0.06449	0.06449	0.06452	0.0653	0.06779	0.07217	0.07876	0.08812	0.10107
10	0.0643	0.0643	0.06434	0.0652	0.06794	0.07277	0.08012	0.09066	0.10542
11	0.06416	0.06416	0.0642	0.06513	0.06813	0.07343	0.08155	0.09332	0.11
12	0.06404	0.06404	0.06408	0.06508	0.06834	0.07412	0.08304	0.09608	0.11481
13	0.06394	0.06394	0.06398	0.06506	0.06857	0.07484	0.08457	0.09897	0.11989
14	0.06385	0.06385	0.06389	0.06506	0.06882	0.07558	0.08617	0.10197	0.12518
15	0.06377	0.06377	0.06382	0.06506	0.06908	0.07634	0.0878	0.10506	0.13074
16	0.0637	0.06371	0.06376	0.06507	0.06935	0.07712	0.08947	0.10827	0.13655
18	0.06359	0.06359	0.06365	0.06512	0.06992	0.07874	0.09296	0.11501	0.149
20	0.0635	0.0635	0.06357	0.0652	0.07054	0.08042	0.09661	0.12222	0.1626
22	0.06343	0.06343	0.0635	0.06528	0.07116	0.08216	0.10043	0.12989	0.17741
24	0.06338	0.06338	0.06345	0.06538	0.07181	0.08394	0.10442	0.13806	0.1935
26	0.06332	0.06332	0.06341	0.06549	0.07248	0.08578	0.10856	0.14676	0.21096
28	0.06327	0.06327	0.06337	0.06561	0.07315	0.08766	0.11291	0.15598	0.22984
30	0.06324	0.06324	0.06334	0.06573	0.07384	0.08961	0.11742	0.16576	0.25021
35	0.06316	0.06317	0.06327	0.06608	0.07562	0.09467	0.12952	0.1929	0.30789
40	0.0631	0.06311	0.06324	0.06642	0.07745	0.10004	0.14287	0.22412	0.37518
45	0.06307	0.06307	0.06321	0.0668	0.07936	0.10573	0.15759	0.25978	0.45113
50	0.06303	0.06303	0.06319	0.06718	0.08132	0.11176	0.17377	0.30011	0.53375
60	0.06298	0.06298	0.06317	0.06797	0.08542	0.12488	0.21089	0.39459	0.70908
70	0.06294	0.06294	0.06316	0.06878	0.08974	0.13953	0.25511	0.50482	0.88486
80	0.06291	0.06292	0.06317	0.06961	0.09429	0.15587	0.30688	0.62476	1.05368
90	0.06289	0.0629	0.06317	0.07046	0.09908	0.17402	0.3663	0.74808	1.2139
100	0.06287	0.06287	0.06319	0.07133	0.10411	0.19418	0.43277	0.8703	1.36597
125	0.06284	0.06284	0.06324	0.07356	0.11785	0.25415	0.62027	1.1597	1.71643
150	0.06282	0.06283	0.0633	0.07586	0.13337	0.32909	0.81757	1.4241	2.03375

Table B-39: σ^2 Unknown C Values for α, P_T, $1-\beta$ = .95 [$0 \leq r \leq .3$]

DF \ r	0.35	0.4	0.45	0.5	0.6	0.7	0.8	0.9	1.0
1	0.08897	0.09235	0.09636	0.10103	0.11272	0.12824	0.14868	0.17551	0.21053
2	0.08508	0.09	0.0959	0.10296	0.12131	0.14713	0.18331	0.23387	0.30345
3	0.08699	0.09375	0.10204	0.11215	0.13948	0.18004	0.23996	0.32684	0.44563
4	0.09063	0.09951	0.11062	0.12447	0.16328	0.22366	0.31609	0.4492	0.61908
5	0.09517	0.10645	0.12085	0.13916	0.19231	0.27827	0.41089	0.59171	0.80164
6	0.10032	0.11433	0.13252	0.15617	0.22691	0.34415	0.52048	0.74203	0.97989
7	0.10602	0.12307	0.14561	0.17551	0.26738	0.42059	0.63872	0.89108	1.14944
8	0.11217	0.13264	0.16019	0.19739	0.31393	0.5056	0.75952	1.035	1.31012
9	0.11881	0.14307	0.17633	0.22188	0.36658	0.59619	0.879	1.17261	1.46265
10	0.12591	0.1544	0.19409	0.24925	0.42467	0.68948	0.99509	1.30426	1.60831
11	0.13351	0.16667	0.21355	0.27951	0.48743	0.78314	1.10724	1.43042	1.74774
12	0.14159	0.1799	0.23488	0.31274	0.55362	0.87552	1.21536	1.55164	1.88187
13	0.15017	0.19418	0.25809	0.34891	0.62192	0.96588	1.31973	1.66846	2.01114
14	0.1593	0.20956	0.28317	0.38791	0.69141	1.05396	1.42062	1.78143	2.1362
15	0.16896	0.22604	0.31027	0.42943	0.76089	1.13956	1.51831	1.89084	2.25732
16	0.17924	0.24367	0.33929	0.47314	0.82993	1.22278	1.61307	1.99704	2.37497
18	0.2016	0.28258	0.40292	0.5657	0.96487	1.38254	1.79489	2.20074	2.60083
20	0.2265	0.32639	0.47287	0.66211	1.0947	1.53433	1.96765	2.39456	2.81561
22	0.25415	0.37491	0.54767	0.75952	1.2193	1.67926	2.13263	2.57968	3.02097
24	0.28468	0.42783	0.62549	0.85593	1.33878	1.81824	2.29092	2.75729	3.21808
26	0.31805	0.4845	0.7045	0.95041	1.45377	1.95181	2.44318	2.92822	3.40778
28	0.35426	0.54391	0.7836	1.04233	1.56464	2.08072	2.59003	3.0932	3.59079
30	0.39322	0.60535	0.86179	1.13159	1.67184	2.20532	2.73212	3.25287	3.76794
35	0.50043	0.7619	1.05075	1.34381	1.92581	2.50076	3.06912	3.63144	4.18826
40	0.61725	0.91626	1.2291	1.54211	2.16302	2.77689	3.38416	3.98547	4.58148
45	0.73755	1.06458	1.39728	1.72879	2.38641	3.03699	3.68106	4.31927	4.95209
50	0.85703	1.20612	1.55676	1.90576	2.59818	3.28372	3.96277	4.63596	5.30374
60	1.086	1.4707	1.85413	2.23563	2.99323	3.74396	4.48837	5.22693	5.96017
70	1.29922	1.7146	2.12814	2.53976	3.3576	4.16867	4.97342	5.7724	6.56616
80	1.49835	1.94202	2.38367	2.82339	3.69763	4.565	5.42615	6.28152	7.13168
90	1.68576	2.15579	2.62399	3.09027	4.01752	4.93799	5.85223	6.76071	7.66406
100	1.8631	2.35831	2.85159	3.34305	4.32056	5.29129	6.25589	7.21481	8.16852
125	2.27161	2.82477	3.37601	3.92542	5.01892	6.10583	7.18652	8.26163	9.33151
150	2.64148	3.24719	3.85107	4.45303	5.65182	6.84393	8.02991	9.2103	10.38556

Table B-40: σ^2 Unknown C Values for α, P_T, $1-\beta$ = .95 [$.35 \le r \le 1$]

DF \ r	1.25	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0
2	0.5718	0.9122	1.565	2.1578	2.7182	3.792	4.8356	5.8649	6.8857
3	0.8403	1.256	2.024	2.7349	3.4155	4.7307	6.0154	7.2849	8.5455
4	1.1004	1.5688	2.4389	3.2555	4.043	5.5726	7.0714	8.5547	10.0289
5	1.3417	1.856	2.8204	3.7338	4.6188	6.3437	8.0378	9.7159	11.3851
6	1.5661	2.1231	3.1757	4.1788	5.1541	7.06	8.9348	10.7937	12.6434
7	1.7764	2.374	3.5096	4.597	5.6569	7.7322	9.7764	11.8046	13.8234
8	1.9751	2.6112	3.8255	4.9926	6.1324	8.3677	10.5718	12.7599	14.9385
9	2.1639	2.8369	4.1263	5.369	6.5848	8.9722	11.3282	13.6681	15.9987
10	2.3443	3.0527	4.4139	5.729	7.0173	9.5497	12.0509	14.536	17.0116
11	2.5173	3.2598	4.69	6.0744	7.4323	10.1039	12.7443	15.3684	17.983
12	2.684	3.4593	4.9557	6.407	7.8318	10.6373	13.4116	16.1695	18.9179
13	2.8446	3.6518	5.2125	6.7282	8.2175	11.1522	14.0555	16.9427	19.8203
14	3.0002	3.8382	5.4608	7.0389	8.5908	11.6505	14.6788	17.6909	20.6931
15	3.151	4.0188	5.7017	7.3403	8.9527	12.1335	15.2831	18.416	21.5394
16	3.2975	4.1944	5.9358	7.6331	9.3042	12.6028	15.8698	19.1206	22.3616
18	3.5788	4.5317	6.3856	8.1957	9.9798	13.5042	16.9973	20.4738	23.9407
20	3.8467	4.8528	6.8138	8.7314	10.6229	14.3622	18.0703	21.7617	25.4436
22	4.1028	5.16	7.2234	9.2435	11.2379	15.1827	19.0964	22.9933	26.8806
24	4.3487	5.4548	7.6165	9.7354	11.8282	15.9705	20.0812	24.1754	28.2598
26	4.5853	5.7387	7.9951	10.2088	12.3966	16.7287	21.0293	25.3132	29.5876
28	4.8138	6.0128	8.3608	10.6659	12.9454	17.4608	21.9446	26.4119	30.8694
30	5.035	6.2781	8.7145	11.1083	13.4764	18.1692	22.8303	27.475	32.1097
35	5.5599	6.9078	9.5543	12.1584	14.7369	19.8505	24.9324	29.9978	35.0533
40	6.0509	7.497	10.3399	13.1407	15.9159	21.423	26.8986	32.3577	37.8065
45	6.514	8.0524	11.0808	14.0671	17.0277	22.9059	28.7525	34.5824	40.4026
50	6.9532	8.5796	11.7838	14.946	18.0828	24.3129	30.5116	36.6932	42.8654
60	7.7736	9.5639	13.0963	16.5868	20.0522	26.9394	33.795	40.634	47.4628

Table B-41: σ^2 Unknown C Values for α, P_T, $1-\beta = .95$ $[1.25 \le r \le 7]$

DF \ r	0.0	0.001	0.01	0.05	0.1	0.15	0.2	0.25	0.3
1	0.0393	0.0393	0.0393	0.03939	0.03969	0.04019	0.0409	0.04184	0.04301
2	0.03537	0.03537	0.03539	0.0355	0.03591	0.03659	0.03756	0.03885	0.04049
3	0.03402	0.03402	0.03403	0.03419	0.03471	0.03559	0.03686	0.03856	0.04074
4	0.03335	0.03335	0.03336	0.03355	0.03419	0.03527	0.03685	0.03899	0.04176
5	0.03294	0.03294	0.03296	0.03319	0.03394	0.03525	0.03715	0.03973	0.04314
6	0.03267	0.03267	0.03268	0.03296	0.03384	0.03535	0.03758	0.04066	0.04477
7	0.03248	0.03248	0.03249	0.03281	0.03381	0.03555	0.03812	0.0417	0.04655
8	0.03234	0.03234	0.03235	0.03271	0.03383	0.03579	0.03872	0.04285	0.04848
9	0.03223	0.03223	0.03224	0.03263	0.03387	0.03606	0.03937	0.04404	0.05054
10	0.03214	0.03214	0.03216	0.03258	0.03395	0.03637	0.04004	0.04532	0.05271
11	0.03207	0.03207	0.03209	0.03255	0.03405	0.0367	0.04076	0.04665	0.055
12	0.032	0.03201	0.03202	0.03252	0.03415	0.03704	0.04151	0.04804	0.05743
13	0.03195	0.03195	0.03197	0.03251	0.03426	0.0374	0.04227	0.04948	0.05997
14	0.03191	0.03191	0.03193	0.03251	0.0344	0.03778	0.04308	0.05098	0.06264
15	0.03187	0.03187	0.03189	0.03251	0.03453	0.03815	0.04389	0.05253	0.06544
16	0.03184	0.03184	0.03186	0.03252	0.03466	0.03854	0.04472	0.05415	0.06839
18	0.03178	0.03178	0.03181	0.03255	0.03495	0.03936	0.04646	0.05754	0.07466
20	0.03173	0.03173	0.03177	0.03258	0.03525	0.04019	0.04829	0.06116	0.08157
22	0.0317	0.0317	0.03173	0.03263	0.03557	0.04106	0.05022	0.06503	0.0891
24	0.03168	0.03168	0.03171	0.03268	0.03589	0.04195	0.05221	0.06912	0.09734
26	0.03164	0.03164	0.03169	0.03273	0.03622	0.04287	0.05429	0.07352	0.10634
28	0.03163	0.03163	0.03168	0.0328	0.03656	0.04383	0.05647	0.07819	0.11618
30	0.03161	0.03161	0.03165	0.03286	0.03691	0.04479	0.05873	0.08318	0.12689
35	0.03157	0.03157	0.03163	0.03303	0.03779	0.04733	0.06482	0.09705	0.15797
40	0.03154	0.03154	0.03161	0.0332	0.03872	0.05001	0.07155	0.11316	0.19611
45	0.03152	0.03152	0.03159	0.03338	0.03967	0.05287	0.07901	0.13193	0.24216
50	0.03151	0.03151	0.03159	0.03358	0.04065	0.05589	0.08723	0.15367	0.29672
60	0.03147	0.03147	0.03157	0.03397	0.0427	0.06248	0.10629	0.20746	0.42957
70	0.03146	0.03146	0.03156	0.03438	0.04486	0.06988	0.12946	0.27695	0.58374
80	0.03145	0.03145	0.03157	0.03479	0.04714	0.07814	0.15738	0.36255	0.74414
90	0.03144	0.03144	0.03157	0.03522	0.04953	0.08736	0.19089	0.46188	0.90152
100	0.03143	0.03143	0.03159	0.03565	0.05206	0.09769	0.23062	0.57001	1.05267
125	0.0314	0.03141	0.03161	0.03676	0.05896	0.12895	0.35898	0.8476	1.40277
150	0.0314	0.0314	0.03163	0.03793	0.06676	0.16965	0.52203	1.11026	1.71973

Table B-42: σ^2 Unknown C Values for α, P_T, $1-\beta = .975$ $[0 \leq r \leq .3]$

DF \ r	0.35	0.4	0.45	0.5	0.6	0.7	0.8	0.9	1.0
1	0.04443	0.04612	0.04811	0.05045	0.0563	0.06411	0.07446	0.08817	0.10638
2	0.0425	0.04498	0.04793	0.05145	0.06068	0.0737	0.09219	0.11861	0.15656
3	0.04346	0.04685	0.05101	0.05608	0.06985	0.09048	0.12172	0.16946	0.24197
4	0.0453	0.04974	0.05532	0.06228	0.08192	0.11307	0.16315	0.24353	0.36566
5	0.04756	0.05324	0.06045	0.06969	0.09677	0.14214	0.21872	0.34314	0.51984
6	0.05015	0.05717	0.06633	0.07828	0.11472	0.1788	0.29041	0.4649	0.68628
7	0.05301	0.06157	0.07297	0.08814	0.13614	0.2243	0.37793	0.5993	0.85181
8	0.0561	0.0664	0.08034	0.09936	0.16159	0.27942	0.47809	0.73682	1.01074
9	0.05944	0.07166	0.08855	0.11206	0.19153	0.34406	0.58566	0.87177	1.16217
10	0.06301	0.07741	0.09764	0.12643	0.22641	0.4173	0.69562	1.00214	1.30664
11	0.06683	0.08363	0.10771	0.14264	0.2666	0.49695	0.80493	1.12756	1.44507
12	0.07091	0.09039	0.11884	0.16081	0.3121	0.58044	0.9115	1.24814	1.57819
13	0.07526	0.09769	0.1311	0.18118	0.36264	0.66541	1.01514	1.36432	1.70636
14	0.07988	0.10563	0.14461	0.20389	0.41757	0.75037	1.11548	1.47656	1.83023
15	0.0848	0.11421	0.15939	0.22906	0.47607	0.83432	1.21271	1.58533	1.95026
16	0.09004	0.12346	0.17569	0.25681	0.53705	0.91663	1.30719	1.6907	2.06689
18	0.10149	0.1442	0.21277	0.32007	0.66266	1.07538	1.4881	1.89304	2.29065
20	0.11444	0.16827	0.25644	0.39304	0.78827	1.22662	1.66003	2.08539	2.5036
22	0.129	0.19611	0.30707	0.47369	0.91113	1.37109	1.8241	2.26923	2.70721
24	0.14534	0.22787	0.36411	0.5592	1.02979	1.50952	1.98138	2.44556	2.90259
26	0.1636	0.26385	0.42682	0.64719	1.14441	1.64264	2.13281	2.61511	3.09064
28	0.18407	0.30414	0.49402	0.73553	1.255	1.771	2.27875	2.77899	3.27228
30	0.20682	0.34863	0.56396	0.82269	1.36194	1.89514	2.4201	2.93747	3.44806
35	0.27429	0.4747	0.74304	1.03308	1.61536	2.18921	2.755	3.31348	3.86536
40	0.35724	0.61377	0.91827	1.23102	1.85175	2.46405	3.06839	3.66541	4.25574
45	0.45355	0.75577	1.08582	1.41742	2.0744	2.72296	3.36365	3.99719	4.62415
50	0.55856	0.89502	1.24493	1.59393	2.28552	2.96869	3.64398	4.31213	4.97369
60	0.776	1.15833	1.54175	1.92316	2.67929	3.427	4.16711	4.90009	5.62665
70	0.98676	1.40186	1.81531	2.22656	3.04248	3.85016	4.65015	5.44318	6.2298
80	1.18542	1.629	2.07037	2.50964	3.38141	4.24493	5.10095	5.9502	6.79285
90	1.37256	1.84259	2.31024	2.77588	3.70038	4.61682	5.52557	6.42755	7.32312
100	1.54971	2.04474	2.53748	3.02802	4.0025	4.96893	5.92786	6.88	7.82574
125	1.95776	2.51056	3.06097	3.60919	4.69922	5.78119	6.85583	7.92352	8.98517
150	2.32727	2.93225	3.53522	4.1358	5.33057	6.51746	7.69702	8.86981	10.0364

Table B-43: σ^2 Unknown C Values for α, P_T, $1-\beta = .975$ $[.35 \leq r \leq 1]$

DF \ r	1.25	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0
2	0.3344	0.6395	1.283	1.8497	2.3736	3.3625	4.3147	5.2496	6.175
3	0.5625	0.9723	1.7269	2.4057	3.0458	4.2691	5.4554	6.6237	7.782
4	0.8115	1.2792	2.1292	2.9095	3.6533	5.0852	6.4799	7.8563	9.2219
5	1.0491	1.5608	2.5001	3.3741	4.2127	5.8348	7.4202	8.9868	10.5425
6	1.2708	1.8226	2.8464	3.8075	4.7342	6.5332	8.295	10.0382	11.7704
7	1.4784	2.0685	3.1725	4.2156	5.2251	7.1898	9.1176	11.0262	12.924
8	1.6743	2.3014	3.4816	4.6025	5.6902	7.8116	9.8961	11.9615	14.016
9	1.8605	2.523	3.7762	4.9711	6.1333	8.404	10.6377	12.8522	15.0557
10	2.0385	2.7351	4.0582	5.3242	6.5574	8.9707	11.347	13.704	16.0496
11	2.2092	2.9388	4.3292	5.6633	6.965	9.5153	12.0282	14.5221	17.0046
12	2.3734	3.1351	4.5905	5.9901	7.3575	10.0397	12.6844	15.3098	17.9242
13	2.532	3.3246	4.843	6.3062	7.7369	10.5463	13.3184	16.0712	18.8126
14	2.6856	3.5083	5.0874	6.6119	8.1046	11.0369	13.9321	16.808	19.6729
15	2.8345	3.6865	5.3247	6.9089	8.4611	11.5129	14.5276	17.5232	20.5071
16	2.9791	3.8595	5.5554	7.1975	8.8077	11.9758	15.1066	18.2179	21.3179
18	3.2573	4.1926	5.9993	7.7525	9.4742	12.8654	16.2195	19.5538	22.8772
20	3.522	4.5099	6.4221	8.2815	10.1094	13.7131	17.2797	20.8264	24.3618
22	3.7755	4.8135	6.8269	8.7876	10.7173	14.5243	18.2944	22.0444	25.7834
24	4.0188	5.1052	7.2158	9.2739	11.3013	15.3036	19.2686	23.2141	27.1479
26	4.2534	5.3862	7.5905	9.7427	11.8638	16.0543	20.2075	24.3406	28.4626
28	4.4797	5.6576	7.9523	10.1953	12.4072	16.7794	21.1143	25.429	29.7327
30	4.699	5.9205	8.3029	10.6337	12.9335	17.4814	21.9921	26.4829	30.9624
35	5.2196	6.5449	9.1355	11.6748	14.1833	19.1488	24.0769	28.9849	33.8818
40	5.7069	7.1294	9.915	12.6495	15.3534	20.7096	26.0284	31.3275	36.6145
45	6.1668	7.6811	10.6505	13.5694	16.4577	22.1825	27.8701	33.5376	39.1934
50	6.6033	8.205	11.3491	14.4426	17.506	23.5807	29.618	35.6356	41.6411
60	7.4189	9.1835	12.6539	16.0743	19.4645	26.1929	32.8835	39.5544	46.2136

Table B-44: σ^2 Unknown C Values for α, P_T, $1-\beta = .975$ $[1.25 \leq r \leq 7]$

DF \ r	0.0	0.001	0.01	0.05	0.1	0.15	0.2	0.25	0.3
1	0.01572	0.01572	0.01572	0.01576	0.01587	0.01607	0.01637	0.01673	0.01719
2	0.01414	0.01414	0.01416	0.0142	0.01436	0.01464	0.01503	0.01554	0.01619
3	0.01361	0.01361	0.01362	0.01368	0.01388	0.01424	0.01474	0.01543	0.0163
4	0.01334	0.01334	0.01334	0.01342	0.01368	0.01411	0.01474	0.0156	0.01671
5	0.01318	0.01318	0.01318	0.01328	0.01358	0.0141	0.01485	0.0159	0.01726
6	0.01307	0.01307	0.01307	0.01318	0.01354	0.01414	0.01504	0.01627	0.01791
7	0.013	0.013	0.013	0.01313	0.01353	0.01421	0.01524	0.01669	0.01863
8	0.01293	0.01293	0.01294	0.01308	0.01353	0.01432	0.0155	0.01714	0.01939
9	0.01289	0.01289	0.0129	0.01306	0.01355	0.01443	0.01575	0.01762	0.02021
10	0.01286	0.01286	0.01286	0.01303	0.01358	0.01456	0.01602	0.01813	0.02109
11	0.01283	0.01283	0.01284	0.01302	0.01362	0.01468	0.01631	0.01867	0.02202
12	0.01281	0.01281	0.01282	0.01301	0.01366	0.01482	0.01661	0.01923	0.02298
13	0.01278	0.01278	0.01279	0.01301	0.01371	0.01497	0.01691	0.0198	0.02401
14	0.01277	0.01277	0.01277	0.01301	0.01376	0.01511	0.01723	0.02039	0.02506
15	0.01275	0.01275	0.01276	0.01301	0.01381	0.01527	0.01756	0.02101	0.02618
16	0.01274	0.01274	0.01275	0.01301	0.01387	0.01543	0.0179	0.02168	0.02737
18	0.01271	0.01271	0.01273	0.01302	0.01398	0.01575	0.01859	0.02303	0.02989
20	0.0127	0.0127	0.01271	0.01303	0.0141	0.01608	0.01932	0.02447	0.03266
22	0.01268	0.01268	0.0127	0.01306	0.01423	0.01643	0.0201	0.02602	0.03571
24	0.01267	0.01267	0.01269	0.01307	0.01436	0.01679	0.0209	0.02767	0.039
26	0.01266	0.01266	0.01268	0.01309	0.01449	0.01715	0.02172	0.02943	0.04266
28	0.01266	0.01266	0.01267	0.01311	0.01463	0.01753	0.02259	0.03131	0.04665
30	0.01265	0.01265	0.01267	0.01314	0.01476	0.01792	0.02351	0.0333	0.05099
35	0.01263	0.01263	0.01266	0.01321	0.01512	0.01893	0.02596	0.03889	0.06372
40	0.01262	0.01262	0.01265	0.01329	0.0155	0.02	0.02866	0.04541	0.07965
45	0.01261	0.01261	0.01263	0.01336	0.01587	0.02115	0.03163	0.05305	0.09943
50	0.0126	0.0126	0.01263	0.01344	0.01626	0.02236	0.03493	0.06194	0.12396
60	0.01259	0.01259	0.01263	0.0136	0.01707	0.02502	0.04262	0.08441	0.1908
70	0.01259	0.01259	0.01263	0.01376	0.01794	0.02797	0.052	0.11481	0.28583
80	0.01258	0.01258	0.01263	0.01392	0.01886	0.03129	0.06345	0.15546	0.40833
90	0.01258	0.01258	0.01263	0.01409	0.01982	0.035	0.07741	0.20874	0.54749
100	0.01257	0.01258	0.01263	0.01426	0.02083	0.03914	0.0943	0.27631	0.69177
125	0.01257	0.01257	0.01265	0.01471	0.0236	0.05182	0.15363	0.49768	1.03857
150	0.01257	0.01257	0.01266	0.01517	0.02673	0.06857	0.245	0.74744	1.35535

Table B-45: σ^2 Unknown C Values for α, P_T, $1-\beta = .99$ $[0 \le r \le .3]$

DF \ r	0.35	0.4	0.45	0.5	0.6	0.7	0.8	0.9	1.0
1	0.01776	0.01845	0.01925	0.02019	0.02252	0.02566	0.0298	0.03532	0.04271
2	0.01701	0.01799	0.01918	0.02059	0.02428	0.0295	0.03694	0.04765	0.06326
3	0.0174	0.01875	0.02042	0.02243	0.02797	0.03625	0.04889	0.06862	0.09988
4	0.01813	0.0199	0.02213	0.02493	0.03282	0.04536	0.06592	0.10043	0.15912
5	0.01903	0.0213	0.02419	0.0279	0.03877	0.05722	0.08945	0.14722	0.24921
6	0.02007	0.02289	0.02655	0.03136	0.04605	0.07242	0.12158	0.21368	0.37189
7	0.02122	0.02465	0.02921	0.03532	0.05479	0.09183	0.16461	0.30267	0.51672
8	0.02245	0.02657	0.03218	0.03983	0.06528	0.11636	0.22083	0.41125	0.66833
9	0.02378	0.0287	0.03548	0.04495	0.07773	0.14703	0.2915	0.5321	0.81738
10	0.02522	0.03099	0.03914	0.05081	0.09265	0.1853	0.375	0.65643	0.9613
11	0.02676	0.03351	0.04321	0.0574	0.11041	0.23163	0.4682	0.77966	1.09937
12	0.02838	0.03621	0.0477	0.06491	0.13147	0.28056	0.56616	0.89941	1.23157
13	0.03012	0.03916	0.05269	0.07338	0.1561	0.34937	0.66577	1.01514	1.35901
14	0.032	0.04234	0.05823	0.08295	0.18494	0.41858	0.76428	1.1272	1.48242
15	0.03397	0.04582	0.06432	0.09375	0.21826	0.49219	0.8606	1.23523	1.60144
16	0.03607	0.04958	0.07104	0.10593	0.25635	0.56836	0.95471	1.34033	1.71716
18	0.0407	0.05804	0.0867	0.13513	0.3457	0.7218	1.13525	1.54175	1.93872
20	0.04591	0.06802	0.10574	0.17157	0.44934	0.87158	1.30664	1.73291	2.15002
22	0.05182	0.07965	0.12881	0.21643	0.56104	1.0155	1.47015	1.91528	2.35144
24	0.0585	0.0932	0.15656	0.27026	0.67474	1.15356	1.62671	2.09033	2.54517
26	0.06606	0.10904	0.18951	0.33289	0.78735	1.2865	1.77722	2.25879	2.73157
28	0.07452	0.12744	0.22833	0.40283	0.89722	1.41467	1.92261	2.42139	2.91138
30	0.08414	0.14868	0.27319	0.47827	1.00378	1.53845	2.06323	2.57849	3.08569
35	0.11371	0.21661	0.40869	0.67566	1.25647	1.83142	2.39612	2.95166	3.49915
40	0.15298	0.30762	0.56506	0.87085	1.49268	2.10498	2.7074	3.30103	3.8866
45	0.20435	0.41895	0.7262	1.05652	1.7146	2.36279	3.0011	3.63062	4.25208
50	0.26898	0.54272	0.88367	1.23303	1.92517	2.60742	3.27979	3.94336	4.59924
60	0.43542	0.79688	1.17993	1.56189	2.31775	3.06335	3.7998	4.52783	5.2478
70	0.62842	1.03931	1.45313	1.86475	2.67957	3.48486	4.28027	5.06763	5.84729
80	0.82288	1.26636	1.70801	2.14709	3.01758	3.87781	4.72925	5.5719	6.40723
90	1.00928	1.47949	1.94751	2.4126	3.33545	4.24805	5.15186	6.04724	6.93494
100	1.18616	1.68164	2.17419	2.66418	3.63647	4.59888	5.55249	6.49768	7.43518
125	1.59375	2.14673	2.69678	3.2439	4.33118	5.4082	6.47681	7.53699	8.58984
150	1.96289	2.56787	3.16992	3.76941	4.96069	6.14246	7.31543	8.47998	9.63721

Table B-46: σ^2 Unknown C Values for α, P_T, $1-\beta$ = .99 [$.35 \leq r \leq 1$]

DF \ r	1.25	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0
2	0.1447	0.3505	0.9835	1.537	2.0314	2.9436	3.8104	4.6564	5.491
3	0.2831	0.6544	1.4117	2.0673	2.6715	3.8079	4.8992	5.9692	7.0269
4	0.4891	0.9562	1.8003	2.5507	3.2538	4.5908	5.8828	7.1532	8.4111
5	0.7167	1.2338	2.1588	2.9982	3.7925	5.3134	6.7896	8.2434	9.6848
6	0.936	1.4908	2.4946	3.4171	4.2964	5.9886	7.6362	9.2615	10.8735
7	1.1422	1.7318	2.8114	3.813	4.7725	6.6255	8.4338	10.2202	11.9934
8	1.3363	1.96	3.1121	4.1887	5.224	7.2297	9.1912	11.1299	13.0562
9	1.5201	2.1771	3.3992	4.5476	5.6554	7.8069	9.9133	11.9978	14.0684
10	1.6959	2.3851	3.6742	4.8918	6.0692	8.3595	10.6055	12.8291	15.0396
11	1.864	2.5851	3.939	5.2229	6.4673	8.8916	11.2712	13.6289	15.9727
12	2.0262	2.7777	4.1946	5.5426	6.8511	9.4043	11.9136	14.3994	16.8721
13	2.1826	2.9634	4.4418	5.8517	7.2224	9.9005	12.5339	15.145	17.7429
14	2.3339	3.1439	4.6816	6.1516	7.5824	10.3813	13.136	15.8679	18.5859
15	2.4803	3.319	4.9146	6.4424	7.9321	10.8486	13.7205	16.5696	19.4048
16	2.6232	3.4893	5.1409	6.7258	8.2723	11.3027	14.2888	17.2515	20.2017
18	2.8975	3.817	5.577	7.2711	8.9275	12.1772	15.3823	18.5654	21.7339
20	3.1589	4.1294	5.993	7.7915	9.5522	13.0115	16.426	19.8179	23.1958
22	3.4091	4.429	6.3915	8.2903	10.151	13.8105	17.4258	21.0176	24.5962
24	3.6497	4.7168	6.7749	8.7693	10.7267	14.5789	18.3867	22.1719	25.9424
26	3.8811	4.994	7.1444	9.2318	11.2815	15.3193	19.3132	23.2837	27.2402
28	4.1052	5.2621	7.5018	9.6786	11.8184	16.0356	20.209	24.3589	28.4949
30	4.322	5.5221	7.8479	10.1118	12.3384	16.7292	21.0762	25.4004	29.71
35	4.8373	6.1395	8.6711	11.1412	13.574	18.3787	23.1387	27.8752	32.5986
40	5.3199	6.7185	9.4431	12.1062	14.7327	19.9241	25.0708	30.1948	35.3042
45	5.7759	7.2649	10.1719	13.0173	15.8269	21.3838	26.896	32.3848	37.8604
50	6.2087	7.7845	10.8644	13.8834	16.8662	22.7703	28.6296	34.4663	40.2891
60	7.0184	8.7554	12.1593	15.5024	18.8101	25.363	31.8713	38.3569	44.8271

Table B-47: σ^2 Unknown C Values for α, P_T, $1-\beta$ = .99 [$1.25 \leq r \leq 7$]

APPENDIX C

PROCEDURE DERIVATION

I. KNOWN POPULATION VARIANCE

A. ERROR LEVEL CONTROL

The α rejection region associated with the hypothesis that the mean is between d_L and d_R is defined by

$$\alpha = P[\bar{x} < C_L] + P[\bar{x} > C_R]$$

where the rejection region is chosen to be symmetric around μ_o (see figure C-1). Since the suprema will occur when

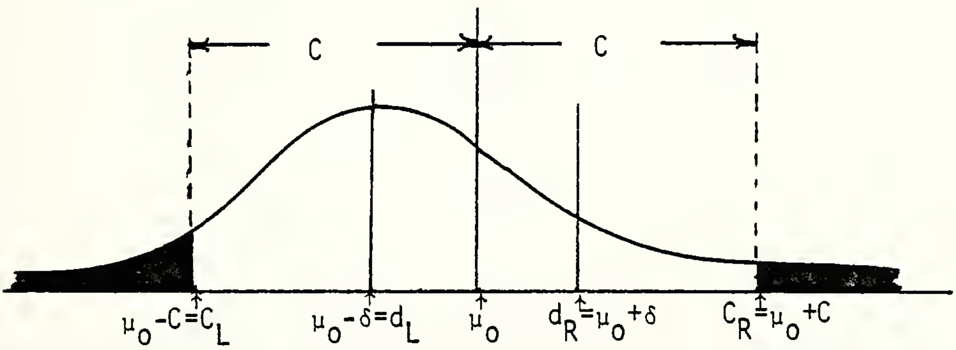


Figure C-1: Density of $\bar{x}$ with μ at d_L (α = ■)

μ equals d_L or d_R, the critical region for the specified upper bound on the Type I error (α) can be written as

$$\alpha = P[\bar{x} < C_L | \text{given } \mu = \mu_o - \delta] + P[\bar{x} > C_R | \text{given } \mu = \mu_o - \delta].$$

Since the sample mean $(\bar{x})$ will be normally distributed, this can be expressed in the form of equation (C-1).

$$\text{(C-1)} \quad \alpha = P\left[z < \frac{\{C_L-(\mu_o-\delta)\}\sqrt{n}}{\sigma} \right] + P\left[z > \frac{\{C_R-(\mu_o-\delta)\}\sqrt{n}}{\sigma} \right]$$

$$\text{where} \quad z = \frac{\sqrt{n}\,[\bar{x}-(\mu_o-\delta)]}{\sigma} \sim N(0,1)$$

Substituting $C_L = \mu_o - C$ and $C_R = \mu_o + C$, equation C-1 becomes

$$\text{(C-2)} \quad \alpha = P\left[z < \frac{(\delta-C)\sqrt{n}}{\sigma} \right] + P\left[z > \frac{(\delta+C)\sqrt{n}}{\sigma} \right]$$

or

$$\alpha = \Phi\left[\frac{\delta\sqrt{n}}{\sigma} - \frac{C\sqrt{n}}{\sigma} \right] + 1 - \Phi\left[\frac{\delta\sqrt{n}}{\sigma} + \frac{C\sqrt{n}}{\sigma} \right]$$

By reparameterizing, the number of parameters necessary for solving equation C-2 can be reduced from five to three. Letting $a = \frac{\delta\sqrt{n}}{\sigma}$ and $C^* = \frac{C\sqrt{n}}{\sigma}$, equation C-2 becomes

$$\text{(C-3)} \quad \alpha = 1 + \Phi[a - C^*] - \Phi[a + C^*]$$

Using the result that $C_L = \mu_o - C$, $C_R = \mu_o + C$, and $C = \frac{\sigma C^*}{\sqrt{n}}$, equation C-4 is obtained and is used to define the rejection region. The hypothesis is then rejected, with a probability of falsely rejecting equal to α, if the sample mean is less than C_L or greater than C_R.

$$\text{(C-4)} \quad C_L = \mu_o - \frac{C^*\sigma}{\sqrt{n}} \quad \text{and} \quad C_R = \mu_o + \frac{C^*\sigma}{\sqrt{n}}$$

For each value of α there is a value of "a" such that the relationship between "a" and C* in equation C-8 is nearly linear (i.e., $C^* = K_E + a$). For a > 1.7 the relationship is approximately linear (starting with 5 significant digits for the worst case with α = .25, and improving as "a" increases) with slope one for all values of $\alpha \leq .25$. The value of K_E can be obtained by considering that if $\Phi[a + C^*] \simeq 1$, then equation C-3 simplifies to equation C-5. This can be rewritten to provide $K_E = \Phi^{-1}[1-\alpha]$. When this linear relationship occurs, C_L and C_R can be obtained using equation C-6.

$$(C\text{-}5) \quad \alpha = 1 + \Phi[a - C^*] - 1 \quad \text{or} \quad \alpha = \Phi[a - C^*]$$

$$(C\text{-}6) \quad C_L = \mu_o - \frac{(K_E + a)\sqrt{n}}{\sigma} \quad \text{and} \quad C_R = \mu_o + \frac{(K_E + a)\sqrt{n}}{\sigma}$$

B. β ERROR LEVEL CONTROL

In order to determine an acceptance region for the hypothesis $d_L \leq \mu \leq d_R$, with a probability no greater than β of falsely accepting, the alternative hypothesis $|\mu - \mu_o| \geq \delta$ is tested. The α rejection region of the alternative hypothesis will be the β acceptance region of the null hypothesis (i.e., $d_L \leq \mu \leq d_R$) and will be defined by $C_L \leq \bar{x} \leq C_R$ (see figure C-2).

The suprema will occur where $\mu = d_L$ or d_R. Thus, the upper bound on the Type II error (β) for the hypothesis $d_L \leq \mu \leq d_R$ can be written as

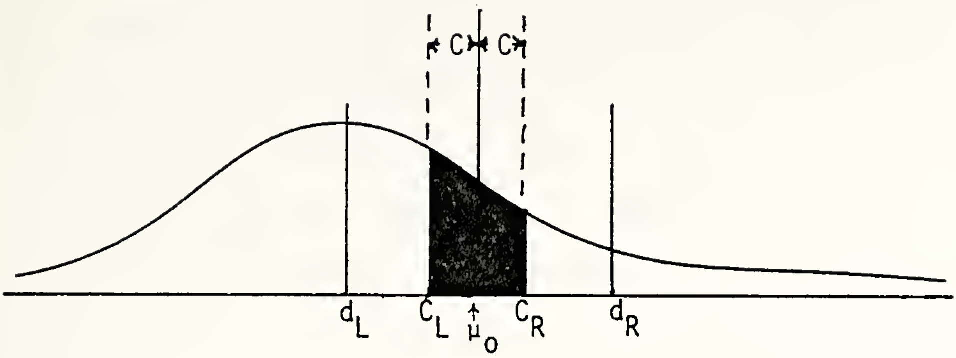


Figure C-2: Density of $\bar{x}$ with μ at d_L (β = shaped area)

$$\sup_{\mu \varepsilon H_a} = \beta(\mu) = P[C_L \leq \bar{x} \leq C_R | \text{given that } \mu = \mu_o - \delta] .$$

This can be expressed in the form of equation C-7.

$$\text{(C-7)} \quad \alpha(H_a) = P[z < \frac{(C_R - \mu_o + \delta)\sqrt{n}}{\sigma}] - P[z < \frac{(C_L - \mu_o + \delta)\sqrt{n}}{\sigma}]$$

$$\text{where} \quad z = \frac{[\bar{x} - (\mu_o - \delta)]\sqrt{n}}{\sigma}$$

By substituting $C_L = \mu_o - C$ and $C_R = \mu_o + C$, and noting that z will be normally distributed (i.e.N(0,1)), equation C-7 reduces to equations C-8.

$$\text{(C-8)} \quad \alpha(H_a) = \Phi[\frac{(\delta + C)\sqrt{n}}{\sigma}] - \Phi[\frac{(\delta - C)\sqrt{n}}{\sigma}].$$

or

$$\alpha(H_a) = \Phi[a + C^*] - \Phi[a - C^*]$$

Equation C-8 can be reformulated to resemble equation C-3 which will permit use of the same solution technique as was used for α error control. Specifically, by multiplying equation C-8 by -1, adding 1 to both sides, and setting

$1-\alpha(H_a)$ equal to α', equation C-8 reduces to equation C-3. The solution of this equation with $\alpha' = 1-\alpha(H_a)$ will also be the solution for $\alpha' = 1-\beta(H_o)$.

For each value of β there is a value of "a" such that the relationship between "a" and C* in equation C-8 is nearly linear (i.e., $C^* = K_E + a$). For a > 3 the relationship is approximately linear (starting with 3 significant digits for the worst case of $\beta = .01$, and improving as a increases) with slope one for all values of $\beta \geq .01$. The value for the constant (K_E) can be determined by noting that when $\Phi[a + C^*] \approx 1$, equation C-8 reduces to equation C-9.

$$\text{(C-9)} \quad \alpha' = 1 - \beta = \Phi[a - C^*] \quad \text{or} \quad a - C^* = \Phi^{-1}[1 - \beta]$$

$$\text{and} \quad C^* = a - K_E \quad \text{where} \quad K_E = \Phi^{-1}[1 - \beta]$$

The value of K_E for β error control will be the negative of the value of K_E for α error control. To allow the same K_E value to be used for both α and β error control, equation C-10 would be used for β error control when this linear relationship holds (i.e., a > 3 for this procedure).

$$\text{(C-10)} \quad C_L = \mu_o - \frac{(a - K_E)\sqrt{n}}{\sigma} \quad \text{and} \quad C_R = \mu_o + \frac{(a - K_E)\sqrt{n}}{\sigma}$$

C. ESTIMATING TAIL PROBABILITY

The actual value of P_T for an observed value of $\bar{x}$ will depend upon the true location of μ within the interval d_L to d_R (see figure C-3). Since μ is unknown, the exact value of P_T cannot be calculated. By setting $\mu = \mu_o - \delta$, the maximum possible value of P_T can be obtained from equation C-3 by substituting P_T for α, and $\frac{(\bar{x} - \mu_o)\sqrt{n}}{\sigma}$ for C^*. For large values of $a + C^*$, this reduces to equation C-11.

$$P_T = \Phi[a - C^*] \quad \text{for} \quad a + C^* > 3.5 \tag{C-11}$$

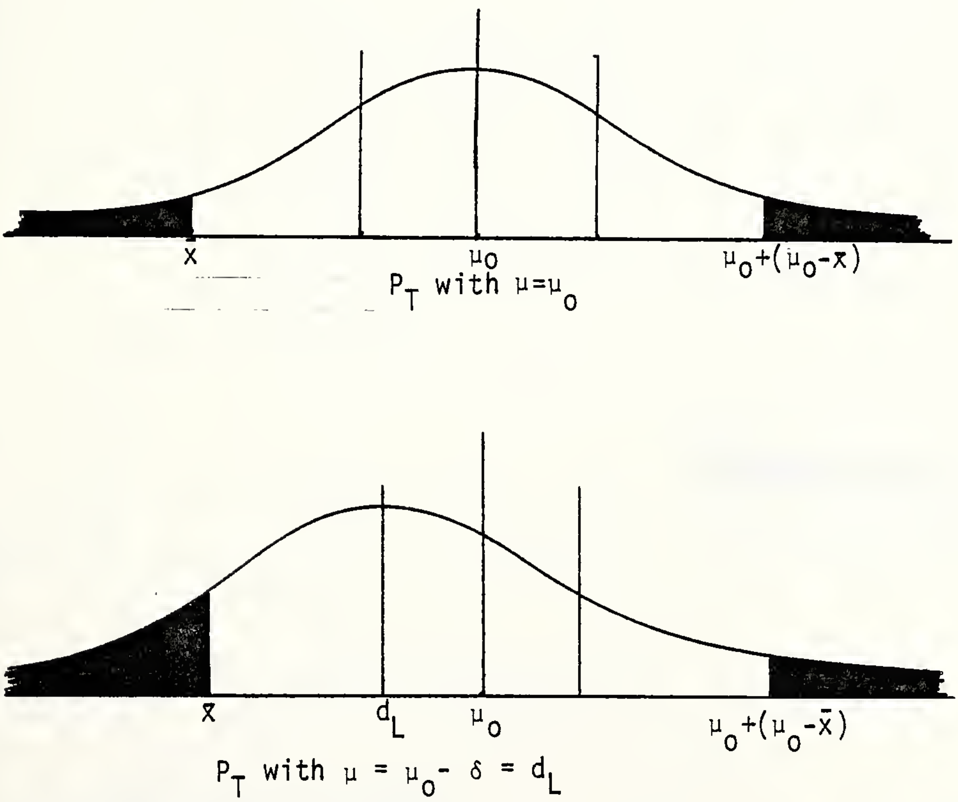


Figure C-3: Dependence of P_T on Location of True μ Value

II. UNKNOWN POPULATION VARIANCE

A. TO TEST THAT $|\mu - \mu_o| \leq r\sigma$

1. α Error Level Control

The statistic

$$\hat{r} = \left| \frac{(\bar{x} - \mu_o)\sqrt{n}}{\sqrt{\hat{\sigma}^2}} \right|$$

is used to perform this test and has the density of the absolute value of a non-central T, as depicted schematically in figure C-4. The associated α error level critical region is defined when the non-central location is at r, resulting in a non-centrality parameter (λ) equal to $r\sqrt{n}$. The corresponding critical value (C) is obtained from equation C-12 and the hypothesis is rejected, with a Type I error equal to α, if $\hat{r}$ is greater than C.

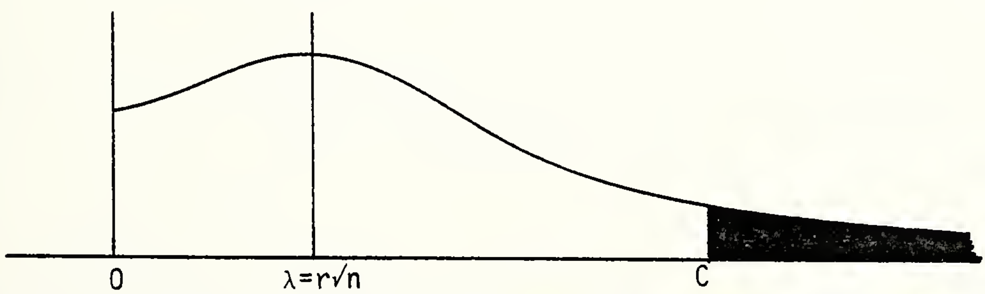


Figure C-4: Density of the Non-central T(Absolute Value) Distributed $\hat{r}$

(C-12) $\alpha = P[\ \hat{r} > C /\ \text{given}\ \lambda = r\sqrt{n}]$

2. β Error Level Control

The suprema for the value of β will occur when $\lambda = r\sqrt{n}$. Equation C-13 is used to determine the value of C

which will define the acceptance region with a β probability of falsely accepting.

$$(C\text{-}13) \quad P[\,|T| < C] = \beta$$

By a slight reformulation, the same solution technique employed in solving for α critical values can be used here. Substituting $\alpha' = 1-\beta$ into equation C-12 and solving for C will provide the critical value associated with the desired level of a Type II error = β. This equivalence is shown in equation C-14.

$$(C\text{-}14) \quad \beta = P[\,|T| < C] = 1 - P[\,|T| > C] \text{ or } P[\,|T| > C] = 1-\beta = \alpha'$$

Because of the equivalence between the C values for α and for $1-\beta$, the critical values for α, P_T, and β can be presented in the same table provided that for a desired value of a Type II error equal to β, the table corresponding to $\alpha = 1-\beta$ is used.

B. TO TEST THAT $CV \leq CV_o$

1. β Error Level Control

To formulate the procedure for testing $CV \leq CV_o$, first consider testing the hypothesis $\frac{1}{CV} \leq r$ or equivalently $\left|\frac{\mu - \mu_o}{\sigma}\right| \leq r$. By setting μ_o equal to zero, the null hypothesis can be rewritten as $\left|\frac{\mu}{\sigma}\right| \leq r$. Solving equation C-12 with $\mu_o = 0$ and $\hat{r} = \left|\frac{\bar{x}\sqrt{n}}{\sqrt{\hat{\sigma}^2}}\right|$ will provide the rejection region with a

Type I error equal to α. However, rejecting the hypothesis that $\frac{1}{CV} \leq r$, when $\hat{r}$ is greater than C, is equivalent to rejecting that $CV > \frac{1}{r}$. This in turn is equivalent to accepting that $CV \leq CV_o$ with a Type II error equal to the value of α. As a result, it is possible to test the hypothesis that the coefficient of variation is less than some specified value (CV_o) by using the previous test procedure for testing that $|\mu - \mu_o| \leq r\sigma$, provided the following differences are observed:

a. Obtain the critical value (C) from the α tables (or curves) associated with a value of α equal to the desired value of a Type II error (β) and with r equal to $\frac{1}{CV_o}$.

b. If $\hat{r}$ is greater than or equal to this value of C, accept the hypothesis $CV \leq CV_o$ with a Type II error = β.

2. <u>α Error Level Control</u>

The same general formulation philosophy applies for α error control of the test $CV \leq CV_o$ as for β error control. Again, first consider accepting the hypothesis $\frac{1}{CV} \leq r$ with a Type II error = β. This is equivalent to accepting that $CV \geq \frac{1}{r}$(or CV_o). However, accepting the hypothesis $CV \geq \frac{1}{r}$ with Type II error = β is equivalent to rejecting that $CV \leq \frac{1}{r}$ (or CV_o) with a Type I error equal to the value β. Thus, the desired test that $CV \leq CV_o$ can be conducted for controlling the Type I error level by using the test procedure

for $|\mu - \mu_o| \leq r\sigma$ and observing the following differences:

a. Obtain the critical value (C) from the β tables (i.e., the table associated with the value $1-\beta$), where the value of β is set equal to the desired value of a Type I error (α) and r is set equal to $\frac{1}{CV_o}$.

b. If $\hat{r}$ is less than this value of C, reject the hypothesis that $CV \leq CV_o$ with a Type I error equal to α.

B. ESTIMATING TAIL PROBABILITY (P_T)

The true value of P_T will depend on the actual value of $\left|\frac{\mu - \mu_o}{\sigma}\right|$ which, under the null hypothesis, may vary from zero to r (see figure C-5). The range of possible values for P_T can be estimated by calculating the P_T associated with the observed value of $\hat{r}$ with λ set at the two extremes zero and $r\sqrt{n}$ in the solution of equation C-12.

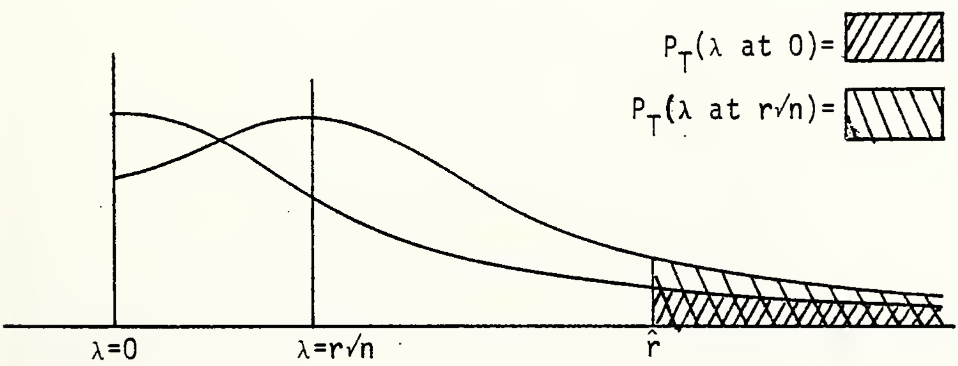


Figure C-5: Dependence of P_T on the True Non-centrality Location

APPENDIX D

SOLUTION TECHNIQUES AND COMPUTER PROGRAMS

I. GENERAL

The same general techniques were used in solving for the critical values in both the known and unknown variance situations. This consisted of a combined proximity interval search and Newton-Raphson technique. A master program was used to monitor and control solutions for C values at various selected combinations of the respective parameter values. Solution accuracy was controlled by stopping the iterative procedure when the desired accuracy in the α or β error level was obtained. The specified accuracy for the case of known σ^2 was .000001. In the case of unknown σ^2, the specified accuracy was .00001 for all parameter values except the following:

1. α = .01 with 125 degrees of freedom and r = .9
2. α = .1 with 90 degrees of freedom and r = .9
3. α = .3 with 125 degrees of freedom and r = 1
4. α = .3 with 60 degrees of freedom and r = 5 and 6
5. α = .4 with 50 degrees of freedom and r = 2.5

The specified accuracy for these latter parameter values was .00005.

II. σ^2 KNOWN SITUATION

The programs used for this case were SIGMAKWN, CINCR, CINCRNEWRAPS, NEWTONRAPS, and NORMPROB. SIGMAKWN was the master problem which stepped solutions along the selected α or β values for each specified "a" value. Controls for switching solution subprograms were necessary for parameter values whose respective C* were too distant to permit solution solely by the Newton-Rapshon method. Equation D-1 was used during proximity interval searching (CINCR and CINCRNEWRAPS).

$$\text{(D-1)} \qquad F(\alpha,a,C^*) = 1 - \Phi[a + C^*] + \Phi[a - C^*]$$

Equation D-2 was employed when the Newton-Rapshon method was used.

$$\text{(D-2)} \quad C_i^* = C_{i-1}^* - \frac{F}{\partial F/\partial C^*} = C_{i-1}^* + \frac{2.50663\{1-\Phi[a+C_{i-1}^*]+\Phi[a-C_{i-1}^*]-\alpha\}}{\text{Exp}[-.5(a+C_{i-1}^*)^2]+\text{Exp}[-.5(a-C_{i-1}^*)^2]}$$

III. σ^2 UNKNOWN SITUATION

The programs used for solving for critical values when σ was unknown were MHUSIGRATIO, MHUSIGRATIOSOLENR, CINCR2, CINCRNEWRAP2, NCT, IB, and TRUNERR. MHUSIGRATIO was the master program stepping solutions along the selected r values for each specified DF. This permitted sole Newton-Raphson solution once the C for the first r value was determined.

To solve for critical values associated with testing the σ^2 unknown two-sided composite null hypothesis, the equation $P[\hat{r} > C] = \alpha$ (where $\hat{r}$ has a non-central T distribution) was solved for values of r between 0 and 1 using the method discussed in reference 2. This method requires use of equation D-3.

$$\text{(D-3)} \quad P[|T|>C] = \sum_{n=0}^{\infty} \left\{ \frac{e^{-\frac{\lambda^2}{2}} \left(\frac{\lambda^2}{2}\right)^n}{n!} \left[\int_x^1 y^{\left(\frac{DF}{2}-1\right)} (1-y)^{\frac{1}{2}(n-1)} dy \right] \right\}$$

where $x = C \div (DF + C^2)$

To solve the infinite series of the product of a Poisson and Beta distribution, the length to which the series must be summed in order to maintain a truncation error less than a specified amount (ε) was determined using the conservative estimate provided by equation D-4. Equation D-4 is solved by iterating m (the length of the series) until the left hand side is less than ε (this task is performed by TRUNERR).

$$\text{(D-4)} \quad \left[\frac{\left(e \frac{\lambda^2}{2}\right)}{m+1} \right]^{m+1} < \varepsilon$$

This method of solving the non-central T is quite adequate for small degrees of freedom ($DF \leq 30$) and non-centrality

values ($\lambda \leq 3$) but becomes lethargic for higher values. As a result, a second program was written in FORTRAN which used the non-central T subroutine of the IMSL packages.

```
     ∇ ARRAY←SIGMAKWN ;JUNK ;I;LOOPS ;ALPHO ;CSTAR ;DIVERG
[1]    ⍝GLOBAL VARIABLES=ALPHA(VECTOR OF DESIRED ALPHA LEVEL);
[2]    ⍝ASTAR(VECTOR OF DESIRED LITTLE A VALUES);OPTION(0 FOR
[3]    ⍝ALPHA CONTROL,1 FOR BETA CONTROL);ERROR(DESIRED ACCURACY)
[4]    JUNK←(I←1),(LOOPS←⍳0),(CSTAR←((1+⍴ALPHA)×(⍴ASTAR))⍳0)
[5]    CSTAR←((⍴ASTAR),(1+⍴ALPHA))⍴CSTAR
[6]   L1:A←ASTAR[I]
[7]    →L6×⍳I=1
[8]    →L4×⍳2>|(A-ASTAR[I-1])
[9]   L6:C←A CINCRNEWRAP ALPHA[1]
[10]  L4:J←2
[11]   CSTAR[I;1]←ASTAR[I]
[12]   LL←12
[13]  L11:ALP←ALPHA[J-1]
[14]   NEWTONRAPS
[15]   →L7×⍳DIVERG=0
[16]   C←A CINCRNEWRAP ALP
[17]  L7:CSTAR[I;J]←C
[18]   →L11×⍳(2+⍴ALPHA)≠J←J+1
[19]   C←CSTAR[I;2]
[20]   →L1×⍳(1+⍴ASTAR)≠I←I+1
[21]   →L2×⍳OPTION≠1
[22]   ALPHO←0,1-ALPHA
[23]   →L3
[24]  L2:ALPHO←0,ALPHA
[25]  L3:ARRAY←,CSTAR
[26]   ARRAY←ALPHO,ARRAY
[27]   ARRAY←(I,(J-1))⍴ARRAY
[28]   'A*VECTOR |←------------------ALPHA/C VECTOR(S)--------------
     ∇


     ∇ C←A CINCRNEWRAP ALP;DELC;LL;SIGN;F;JUNK;LOOPF
[1]    JUNK←(DELC←1),(SIGN←1),(LOOPF←0),(C←A),(LL←25)
[2]    →L2×⍳ALP≤0.5
[3]    C←(A-3)
[4]   L1:C←C+DELC
[5]    →L5×⍳LL=LOOPF←LOOPF+1
[6]   L2:F←1+((NORMPROB(A-C))-NORMPROB(A+C))+(¯1)×ALP
[7]    →L3×⍳LOOPF≠0
[8]    →L3×⍳F>0
[9]    SIGN←¯1
[10]  L3:→L1×⍳0<SIGN×F
[11]   →L4×⍳DELC<1
[12]   →L1×⍳LOOPF=0
[13]   C←C-DELC
[14]   →L1,DELC←DELC÷2
[15]  L4:NEWTONRAPS
[16]   →0
[17]  L5:'***DIVERGENT AT ';LL;'LOOPS,FINAL C=';C;' AND DELC=';DELC
     ∇
```

```
     ∇ NEWTONRAPS;JUNK;LL;LOOP;DOWN;UP;CTEMP
[1]     JUNK←(LL←12),(LOOP←0),(DIVERG←0)
[2]    L1:UP←1+((¯1)×NORMPROB(A+C))+(NORMPROB(A-C))+((¯1)×ALP)
[3]     DOWN←(*((¯0.5)×((A+C)*2)))+(*((¯0.5)×((A-C)*2)))
[4]     →L3×⍳DOWN≠0
[5]     DIVERG←1
[6]     →0
[7]    L3:C←C+2.50662875×UP÷DOWN
[8]     →L2×⍳LL≠LOOP←LOOP+1
[9]     C←A CINCR ALP
[10]    →0
[11]   L2:→L1×⍳ERROR≤|UP
     ∇


     ∇ C←A CINCR ALP;DELC;LL;SIGN;F;JUNK;LOOPF
[1]     JUNK←(C←A),(LOOPF←0),(SIGN←1),(LL←50)
[2]     →L2×⍳ALP≤0.5
[3]     C←(A-3)
[4]    L1:C←C+DELC
[5]     →L5×⍳LL=LOOPF←LOOPF+1
[6]    L2:F←1+((NORMPROB(A-C))-NORMPROB(A+C))+(¯1)×ALP
[7]     →L3×⍳LOOPF≠0
[8]     →L3×⍳F>0
[9]     SIGN←¯1
[10]   L3:→L1×⍳0<SIGN×F
[11]    →L4×⍳ERROR>|F
[12]    →L1×⍳LOOPF=0
[13]    C←C-DELC
[14]    →L1,DELC←DELC÷2
[15]   L4:'FIRSTC = ';C;' WITH DELC=';DELC;' AND LOOPS=';LOOPF
[16]    →0
[17]   L5:'***DIVERGENT AT ';LL;'LOOPS,FINAL C=';C;' AND DELC=';DELC
     ∇


     ∇ P←NORMPROB X;Z
[1]     →3×⍳~∧/(|X←¯6.5⌈6.5⌊X)∊ 0 6.5
[2]     →0,P←0.5+0.5××X
[3]     Z← 0.31938153 ¯0.356563782 1.781477937 ¯1.821255978 1.330274429
[4]     P←(*¯0.5×X×X)÷(○2)*0.5
[5]     P←0.5+(×X)×0.5-P×((÷1+0.2316419×|X)∘.*⍳5)+.×Z
     ∇
```

```
    ∇ C←A CINCRNEWRAP2 ALP;LL;SIGN;F;LOOPF;JUNK;DELC
[1]    ⍝GLOBAL INPUT:C(INITIAL GUESS),DF
[2]    JUNK←(SIGN←1),(LOOPF←0),(LL←30),(C←A-DELC),(DELC←1)
[3]    →L1×⍳((ALP≥0,05)+(DF≥5))≥1
[4]    JUNK←(LL←60),(C←A-DELC),(DELC←10)
[5]   L1:C←C+DELC
[6]    →L5×⍳LL=LOOPF←LOOPF+1
[7]    CI←LAM NCT C
[8]    F←CI-ALP
[9]    →L3×⍳LOOPF≠0
[10]   →L3×⍳F>0
[11]   SIGN←¯1
[12]  L3:→L1×⍳0<SIGN×F
[13]   →L4×⍳DELC<0,51
[14]  L2:C←C-DELC
[14]   →L1,DELC←DELC÷2
[16]  L4:DERVIAT←(CI-(LAM NCT(C-1E¯8)))÷1E¯8
[17]   →L2×⍳DERVIAT=0
[18]   →L2×⍳DELC<(F÷DERVIAT)
[19]   NEWTONRAPS2
[20]   →0
[21]  L5:'***DIVERGENT AT ';LL;'LOOPS IN CINCRNEWRAP2(I=';I;'J=';J;'
[22]   C←A CINCR2 ALP
    ∇


    ∇ NEWTONRAPS2;LL;CTEMP;JUNK
[1]    ⍝GLOBAL INPUT:ERROR(DESIRED ACCURACY)
[2]    JUNK←(LL←12),(LOOP←0),(DIVERG←0)
[3]    F←CI-ALP
[4]   L1:FTEMP←F
[5]    C←C-F÷DERVIAT
[6]    CI←LAM NCT C
[7]    F←CI-ALP
[8]    →0×⍳ERROR>|F
[9]    →L2×⍳LOOP>1
[10]   DERVIAT←(CI-(LAM NCT(C-1E¯8)))÷1E¯8
[11]  L2:→L1×⍳LL≠LOOP←LOOP+1
[12]   '****NEWTONRAPS DID NOT CONVERGE(I=';I;',J=';J;'),SWITCHED
[12]   DIVERG←1
[14]   →0×⍳KILL≠1
[15]   C←CSTAR[I;J-1] CINCR2 ALP
    ∇


    ∇ PTUPPER←LAM NCT C;POSSO;JUNK;IBZERO;LL;I
[1]    ⍝GLOBAL INPUT:DF,CYCLE(NUMBER OF LOOPS REQUIRED TO
[2]    ⍝  CONTROL TRUNCATION ERROR)
[3]    ⍝GLOBAL INPUT→P=DF÷2;DF←NS-1
[4]    JUNK←(POSSO←(1÷*LAM)),(IBZERO←P IB 0,5),(XX←DF÷(DF+C*2))
[5]    JUNK←(PTUPPER←POSSO×IBZERO),(I←1)
[6]    →0×⍳CYCLE=0
[7]   L1:LL←POSSO×LAM÷I
[8]    PTUPPER←PTUPPER+(P IB(I+0,5))×LL
[9]    POSSO←LL
[10]   →L1×⍳(1+CYCLE)≠I←I+1
    ∇
```

```
∇ ARRAY←MHUSIGRATIO;A;NS;DF;P;C;LAMV;CYCLE;LAM;LAMV;LAMSQ2;XX;LAM
   ⍝GLOBAL VARIABLES=LITTR(VECTOR TEST |MHU/SIG|≤ LITTR)
   ⍝DFVECT(VECTOR OF DEGREE OF FREEDOM);ALP=LOS;ERROR=DESIRED PRECISION
   JUNK←(I←1),(A←LITTR[1]),(KILL←0)
   DFVECT←,DFVECT
   CSTAR←((1+⍴LITTR)×(⍴DFVECT))⍴0
   CSTAR←((⍴DFVECT),(1+⍴LITTR))⍴CSTAR
   PRECISION←1÷ERROR
  L1:DF←DFVECT[I]
   'DATA FOR DF=';DF;' WITH ALPHA=';ALP
   '  LOOP TIME  LITTR    C'
   P←DF÷2
   LAMV←LITTR×(DF+1)*0.5
   CYCVECT←LAMV TRUNERR ERROR
   CYCLE←CYCVECT[1]
   TIMEO←⌶21
   LAM←LAMSQ2[1]
   →L5×⍳A>0
   A←0.0001
  L5:C←A CINCRNEWRAP2 ALP
   →L6×⍳DIVERG=0
   C←A CINCR2 ALP
  L6:J←2
   CSTAR[I;1]←DFVECT[I]
  L11:→L13×⍳CSTAR[I;J]=¯1
   →L7×⍳J=2
   TIMEO←⌶21
   CYCLE←CYCVECT[J-1]
   LAM←LAMSQ2[J-1]
   CI←LAM NCT C
   DERVIAT←(CI-(LAM NCT(C-1E¯8)))÷1E¯8
   NEWTONRAPS2
   →L7×⍳DIVERG=0
   KILL←1
   C←CSTAR[I;J-1] CINCRNEWRAP2 ALP
   KILL←0
  L7:CSTAR[I;J]←C
   TIMEJ←((⌶21)-TIMEO)÷60
   '     ';LOOP;'     ';⌈TIMEJ;'     ';LITTR[J-1];'      ';C
   →L13×⍳J=2
   MULT←1
   →L15×⍳1≤((LITTR[J-1]≤0.4)+((J-1)=⍴LITTR))
   MULT←(LITTR[J]-LITTR[J-1])÷(LITTR[J-1]-LITTR[J-2])
  L15:C←C+MULT×(C-CSTAR[I;J-1])
  L13:→L11×⍳(2+⍴LITTR)≠J←J+1
   '--------------------------------------------------------------'
   →L1×⍳(1+⍴DFVECT)≠I←I+1
   TEMPLITTR←0,LITTR
   ARRAY←,CSTAR
   ARRAY←TEMPLITTR,ARRAY
   ARRAY←(I,(J-1))⍴ARRAY
∇
```

```
∇ ARRAY←MHUSIGRATIOSOLENR OLDCARR;A;NS;DF;P;C;CYCLE;LAMV;LAMSQ2;XX;LAM
  ⍝GLOBAL VARIABLES=LITTR(VECTOR TEST |MU/SIG|≤ LITTR)
  ⍝DFVECT(VECTOR OF DEGREE OF FREEDOM);ALP=LOS;ERROR=DESIRED PRECISION
  ⍝OLDCARR(2×⍴DFVECT ARRAY OF PREVIOUS C'S WITH ROW1 EQUAL TO
  ⍝ 0,OLD LITTR ⍳-2 AND ⍳-1,COL1 EQUAL TO 0,DFVECT)
  ⍝CESTIMATE(VECTOR OF ESTIMATED C FOR FIRST ELEMENT OF LITTA IN EACH DF
  CESTIMATE←LITTR[1] CESTIMATOR OLDCARR
  DFVECT←,DFVECT
  JUNK←(I←1),(A←CESTIMATE[1]),(KILL←0)
  CSTAR←((1+⍴LITTR)×(⍴DFVECT))⍴0
  CSTAR←((⍴DFVECT),(1+⍴LITTR))⍴CSTAR
  PRECISION←1÷ERROR
L1:DF←DFVECT[I]
  'DATA FOR DF=';DF;' WITH AKPHA=';ALP
  '  LOOP   TIME    LITTR      C'
  P←DF÷2
  LAMV←LITTA×(DF+1)*0.5
  CYCVECT←LAMV TRUNERR ERROR
  CYCLE←CYCVECT[1]
  TIMEO←⌶21
  LAM←LAMSQ2[1]
  C←CESTIMATE[I]
  CI←LAM NCT C
  DERVIAS←(CI-(LAM NCT(C-1E¯8)))÷1E¯8
  NEWTONRAPS2
L6:J←2
  CSTAR[I;1]←OLDCARR[I+1;3]
L11:→L13×⍳CSTAR[I;J]=¯1
  →L7×⍳J=2
  TIMEO←⌶21
  CYCLE←CYCVECT[J-1]
  LAM←LAMSQ2[J-1]
  CI←LAM NCT C
  DERVIAT←(CI-(LAM NCT(C-1E¯8)))÷1E¯8
  NEWTONRAPS2
  →L7×⍳DIVERG=0
  KILL←1
  C←CSTAR[I;J-1] CINCRNEWRAP2 ALP
  KILL←0
L7:CSTAR[I;J]←C
  TIMEJ←((⌶21)-TIMEO)÷60
  '      ';LOOP;'    ';⌈TIMEJ;'      ';LITTR[J-1];'        ';C
  MULT←1
  →L14×⍳J≠2
  MULT←(LITTR[J]-LITTR[J-1])÷(LITTR[J-1]-OLDCARR[1;3])
  →L15
L14:→L15×⍳1≤((LITTR[J-1]≤0.4)+((J-1)=⍴LITTR))
  MULT←(LITTR[J]-LITTR[J-1])÷(LITTR[J-1]-LITTR[J-2])
L15:C←C+MULT×(C-CSTAR[I;J-1])
L13:→L11×⍳(2+⍴LITTR)≠J←J+1
  CSTAR[I;1]←DFVECT[I]
  '-----------------------------------------------------------------'
  →L1×⍳(1+⍴DFVECT)≠I←I+1
  TEMPLITTR←0,LITTR
  ARRAY←,CSTAR
  ARRAY←TEMPLITTR,ARRAY
  ARRAY←(I,(J-1))⍴ARRAY
∇
```

```
     ∇ M←LAMV TRUNERR ERROR;JUNK;ELAM;N;K;ERR
[1]     ⍝GLOBAL INPUT:LITTR,ERROR
[2]     JUNK←(K←1),(M←⍳0),(LAMSQ2←0.5×LAMV*2)
[3]    L1:→L3×⍳LITTR[K]>1
[4]     →L11×⍳LAMV[K]≤6
[5]     →L4,(N←1),(CSTAR[I;K+1]←¯1)
[6]    L11:→L3×⍳LAMV[K]≥0.1
[7]     N←1
[8]     →L4
[9]    L3:N←(((⌈LAMV[K])*2)+2×⌈LAMV[K])-2
[10]    ELAM←LAMSQ2[K]×2.71828183
[11]   L2:ERR←(ELAM÷N+1)*N+1
[12]    N←N+1
[13]    →L2×⍳ERR>ERROR
[14]   L4:M←M,N-1
[15]    →L1×⍳(1+⍴LAMV)≠K←K+1
     ∇


     ∇ R←P IB Q;V;M;A;X;B;BB;H;QQ;I;P;J;PRECIS
[1]     ⍝GLOBAL INPUT:XX(DF÷(DF+C*2)),PRECISION(EQUALS 1÷ERROR)
[2]     X←V/WX×V←XX≤0.5
[3]     J←(I←0),(R←0)
[4]    L1:A←(Q=⌊Q)+(Q-⌊Q)×Q≠⌊Q
[5]     I←I+1
[6]     →L4×⍳(+/V)=0
[7]     M←⌈P⌈(⍟PRECISION÷(P!A+P-1)×(⌈/X)*P)÷0.6931471806
[8]     B←0
[9]     →L3×⍳A=1
[10]    BB←(⍳M)∘.≥⍳M
[11]    B←(M,M)⍴((⍳M)-A)÷⍳M
[12]    B←×/(B×BB)+1-BB
[13]    B←(H←(X*P)×P!A+P-1)∘.×B×P÷P+⍳M
[14]    B←H++/B×X∘.*⍳M
[15]   L3:H←(QQ,QQ)⍴(Q+1-⍳QQ)÷P+Q-⍳QQ←⌊Q
[16]    BB←(⍳QQ)∘.≥⍳QQ
[17]    BB←×/(H×BB)+1-BB
[18]    BB←(((Q!P+Q-1)×X*P)∘.×BB)×(1-X)∘.*Q-⍳QQ
[19]    B←B++/BB
[20]    R←R+(V\B×I=1)+(V\1-B)×I=2
[21]   L4:H←P
[22]    J←(V←~V),(Q←H),(P←Q)
[23]    X←V/1-XX
[24]    →L1×⍳(0<⍴X)∧I=1
     ∇

     ∇ CESTIMATE←NEWR1 CESTIMATOR PREVIOUSARR;LAST2;JUNK;I;DFOLD;MULT
[1]     ⍝GLOBAK INPUT→DFVECT ASSOCIATED WITH NEW LITTR
[2]     JUNK←(R←1↑⍴PREVIOUSARR),(I←1),(CESTIMATE←⍳0)
[3]     LAST2←(R,¯2)↑PREVIOUSARR
[4]     DFOLD←,1↓PREVIOUSARR[;1]
[5]     MULT←(NEWR1-LAST2[1;2])÷(LAST2[1;2]-LAST2[1;1])
[6]    L1:→L2×⍳1≠(+/(DFVECT=DFOLD[I]))
[7]     CESTIMATE←CESTIMATE,(MULT×(LAST2[I+1;2]-LAST2[I+1;1]))+LAST2[I+1;2]
[8]    L2:→L1×⍳(1+⍴DFOLD)≠I←I+1
     ∇
```

SYNTAX: PTAIL←DFVECT NCT CVECT

THIS FUNCTION CALCULATES THE UPPER AND LOWER TAIL PROBABILITY OF A NON-CENTRAL T DISTRIBUTED R.V. RELATIVE TO A DESIRED VALUE C(FOR EXAMPLE,PTAIL =PROB[|R.V.|>C]),DFVECT IS A VECTOR (OR SCALAR) CONTAINING DEGREES OF FREEDOM OF INTEREST,CVECT IS A VECTOR(OR SCALAR) CONTAINING C VALUES OF INTEREST.FUNCTIONS ASSOCIATED WITH(AND CALLED AUTOMATICALLY) ARE IB(INCOMPLETE BETA) AND TRUNERR(DETERMINES LEVEL TO WHICH THE INFINITE SERIES ASSOCIATED WITH THE NCT CDF MUST BE SUMMED IN ORDER TO RESTRICT THE TRUNCATION ERROR TO THE SPECIFIED VALUE).THE CPU TIME REQUIRED TO EXECUTE THIS FUNCTION FOR ONE VALUE IS GREATLY EFFECTED BY THE SPECIFIED VALUES OF DF,ERROR,C,AND A(AS DEFINED BELOW).THE LARGER THE DF AND A,AND SMALLER THE ERROR THE GREATED THE CPU TIME,AS A ROUGH IDEA- FOR ERROR←.0001,.01≤A≤.2,1≤DF≤16; .01≤CPU≤2 SEC. PER VALUE,FOR ERROR←.000001,.2≤A≤1,16≤DF≤50,2≤CPU≤120 SEC. PER VALUE.TO COPY ONLY THE FUNCTIONS NECESSARY FOR NCT,COPY GROUP NONCENTRALT

GLOBAL INPUT

1.ERROR←DESIRED LEVEL OF ACCURACY(I.E. ERROR←.0001 WILL PROVIDE RESULTS WITH A TRUNCATION ERROR OF LESS THEN .0001 FROM THE TRUE TAIL AREA)

2.A←LOCATION(DISTANCE) OF THE NCT FROM ZERO(NOTE:THIS DETERMINES THE NONCENTRALITY PARAMETER -LAM-).

3.OPTION←0 OR 1(0 WILL READ IN GLOBAL -A- AND CALCULATE -LAM- INTERNALLY ,1 WILL READ IN -LAM- GLOBALLY AND CALCULATE -A- INTERNALLY FOR EACH DEGREE OF FREEDOM

4.LAM←NONCENTRALITY PARAMETER=A×(DF+1)*.5[NEED ONLY BE SPECIFIED IF OPTION←1]

5.HEADING←0 OR 1(0 WILL SUSPRESS PRINTING OF A DESCRIPTIVE HEADING ABOVE THE OUTPUT PTAIL ARRAY).NOTE:SPACING FOR THE DESCRIPTIVE HEADER IS DESIGNED FOR)DIGITS 4,5, OR 6.

OUTPUT

OUTPUT FROM THE FUNCTION WILL CONSIST OF AN ARRAY(SCALAR) OF VALUES WITH CVECT AS THE FIRST ROW,DFVECT AS THE FIRST COLUMN,-A- AS THE SECOND COLUMN,-LAM- AS THE THIRD COLUMN, AND THE ASSOCIATED PTAIL IN THE REMAINING COLUMNS AND ROWS

```
    ∇ CYCLE←LAM TRUNERR ERROR;JUNK;ELAM;N;ERR
[1]   JUNK←(CYCLE←((⌊LAM)*2)+3×⌊LAM),(LAMSQ2←0.5×LAM*2)
[2]   ELAM←LAMSQ2×2.71828183
[3]  L1:ERR←(ELAM÷CYCLE+1)*CYCLE+1
[4]   CYCLE←CYCLE+1
[5]   →L1×⍳ERR>ERROR
[6]   CYCLE←CYCLE-1
    ∇
```

```
    ∇ PTAIL←DFVECT NCT CVECT;JUNK;DF;C;P;LAMSQ2;XX;LL;N;IBZERO;PT
[1]    JUNK←(I←1),(DFVECT←,DFVECT),(CVECT←,CVECT),(PRECISION←1÷ERROR)
[2]    PTAIL←0,0,0,CVECT
[3]   L1:JUNK←(P←0.5×DF),(DF←DFVECT[I])
[4]    →L2×⍳OPTION=1
[5]    LAM←A×(DF+1)*0.5
[6]    →L3
[7]   L2:(A←LAM÷(DF+1)
[8]   L3:PTAIL←PTAIL,DF,A,LAM
[9]    CYCLE←LAM TRUNERR ERROR
[10]  L4:JUNK←(POSSO←1÷*LAMSQ2),(J←1)
[11]  L5:JUNK←(IBZERO←P IB 0.5),(XX←DF÷(DF+CVECT[J]*2)),(N←1)
[12]   JUNK←(PT←POSSO×IBZERO),(LL←POSSO)
[13]   →L7×⍳CYCLE=0
[14]  L6:LL←LL×LAMSQ2÷N
[15]   PT←PT+(P IB(N+0.5))×LL
[16]   →L6×⍳(1+CYCLE)≠N←N+1
[17]  L7:PTAIL←PTAIL,PT
[18]   →L5×⍳(1+⍴CVECT)≠J←J+1
[19]   →L1×⍳(1+⍴DFVECT)≠I←I+1
[20]   PTAIL←((1+⍴DFVECT),(3+⍴CVECT))⍴PTAIL
[21]   →0×⍳HEADING=0
[22]   '   DF    |      A      |     LAM     |←--C AND ASSOCIATED PTAIL --→'
    ∇


    ∇ R←P IB Q;V;M;A;X;B;BB;H;QQ;I;P;J;PRECIS
[1]    ⍝ INCOMPLETE BETA FNC. - REQUIRES DATA VECTOR XX
[2]    X←V/XX×V←XX≤0.5
[3]    J←(I←0),(R←0)
[4]   L1:A←(Q=⌊Q)+(Q-⌊Q)×Q≠⌊Q
[5]    I←I+1
[6]    →L4×⍳(+/V)=0
[7]    M←⌈P⌈(⍟PRECISION÷(P!A+P-1)×(⌈/X)*P)÷0.6931471806
[8]    B←0
[9]    →L3×⍳A=1
[10]   BB←(⍳M)∘.≥⍳M
[11]   B←(M,M)⍴((⍳M)-A)÷⍳M
[12]   B←×/(B×BB)+1-BB
[13]   B←(H←(X*P)×P!A+P-1)∘.×B×P÷P+⍳M
[14]   B←H++/B×X∘.*⍳M
[15]  L3:H←(QQ,QQ)⍴(Q+1-⍳QQ)÷P+Q-⍳QQ←⌊Q
[16]   BB←(⍳QQ)∘.≥⍳QQ
[17]   BB←×/(H×BB)+1-BB
[18]   BB←(((Q!P+Q-1)×X*P)∘.×BB)×(1-X)∘.*Q-⍳QQ
[19]   B←B++/BB
[20]   R←R+(V\B×I=1)+(V\1-B)×I=2
[21]  L4:H←P
[22]   J←(V←~V),(Q←H),(P←Q)
[23]   X←V/1-XX
[24]   →L1×⍳(0<⍴X)∧I=1
    ∇
```

APPENDIX E

LIST OF REFERENCES

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